

The Plank Canoe of Southern California: Not a Polynesian Import, but a Local Innovation

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By nearly a millennium ago, Polynesians had settled most of the habitable islands of the eastern Pacific, as far east as Easter Island and as far north as Hawai‘i, after journeys of thousands of kilometers across open water. It is reasonable to ask whether Polynesian voyagers traveled thousands of kilometers more and reached the Americas.

Despite much research and speculation over the past two centuries, evidence of contact between Polynesia and the Americas is scant. At present, it is generally accepted that Polynesians did reach South America, largely on the basis of the presence of the sweet potato, an American cultivar, in prehistoric East Polynesia. More such evidence would be significant and exciting; however, no other argument for such contact is currently free of uncertainty or controversy.¹

In a separate debate, archaeologists and ethnologists have been disputing the rise of the unusually complex society of the Chumash of Southern California. Chumash social complexity was closely associated with the development of the plank-built canoe (Hudson et al. 1978), a unique technological and cultural complex, whose origins remain obscure (Gamble 2002).

In a recent series of papers, Terry Jones and Kathryn Klar present what they claim is linguistic, archaeological, and ethnographical evidence for prehistoric contact from Polynesia to the Americas (Jones and Klar 2005, Klar and Jones 2005). At the core of their argument is the proposal that the sewn-plank canoe appeared among the Chumash and neighboring Gabrielino people of Southern California through the arrival there of Polynesians using similar boats.² This work has generated interest among students of North American and Oceanic prehistory (Nicolay 2005, 2007; Rick et al. 2005:208; Clarke et al. 2006:894; Kirch and Kahn 2007:200; Weisler and Green 2008; Bentley et al. 2007:645; Matisoo-Smith 2009:160; Raab et al. 2009:220, Matisoo-Smith and Ramirez 2010:85), attention in the popular press (Edgar 2005; Davidson 2005; Smith 2011), and some criticism (Anderson 2006; Arnold 2007; Lawler 2010:1347).

In this paper, I give a comprehensive review of Jones and Klar’s arguments. I conclude that they fail to demonstrate prehistoric contact between Polynesia and Southern California. Instead, a review of the linguistic, technological, archaeological and ethnological evidence supports a new scenario in which the plank canoe was independently elaborated in California from earlier dugout boats, long before the settlement of East Polynesia.

¹ Storey et al. (2007) have recently claimed that chicken remains found in Chile are genetically Polynesian and are in a pre-European context (see discussion in Gongora et al. 2008a, 2008b; Storey et al. 2008; Storey et al. 2011). There is preliminary evidence that human remains from near the Chilean coast may be Polynesian (Matisoo-Smith and Ramirez 2010; Matisoo-Smith 2011). Green (2000) and Clarke et al. (2006) present suggestive but not fully conclusive evidence for an American origin of some varieties of the Polynesian bottle gourd. Other than the word for sweet potato, there is no accepted linguistic evidence for early Polynesian-American contact.

² In this paper, I use the name Gabrielino for the language now usually called Tongva by the descendants of its original speakers. I use the common ‘Hawaiian’ for the more correct Hawai‘ian, ‘Maori’ for Māori, ‘Samoan’ for Sāmoan and ‘Tubuai’ for Tupua‘i. For other Polynesian languages I follow common but inconsistent conventions: ‘Tongan’, not ‘Tonga’, but ‘Tikopia’, not ‘Tikopian’, etc.

1 Introduction

1.1 Jones and Klar's Proposal

Jones and Klar's proposal was presented in several papers, which I will refer to by single letter abbreviations. The proposal was first presented in Jones and Klar (2005), hereafter A, and, its linguistic arguments were elaborated in Klar and Jones (2005), hereafter B. Anderson (2006) presented a critique of A, which was followed by a rejoinder in Jones and Klar (2006), hereafter C. Arnold (2007) is a detailed critical review of A, with a reply by Klar and Jones (2008), hereafter D, another version of which appeared as Jones and Klar (2009), hereafter E.³ I summarize Jones and Klar's arguments as follows:⁴

- Planked canoe construction was practiced prehistorically in the Americas only by the Chumash and Gabrielino of Southern California and by the Mapuche of Chile, yet widespread among the Polynesians, who are known from other evidence to have reached the Americas.
- The Chumash and Gabrielino planked canoe appears in the archaeological record at about the time Polynesians first reached East Polynesia and the Americas, or soon afterwards.
- A certain style of fishhook, the curved-barb compound fishhook, is of a Polynesian form, and appears in the Chumash archaeological record at about the same time as the planked canoe.
- Several Native American words describing plank canoes have no apparent internal etymologies but can be derived from relevant Polynesian vocabulary:
 - The Chumash word for the planked canoe, reconstructed to the earlier form **tomolo* or **tomoloʔo*, can be derived from a Polynesian word, **tumura:ʔau*, meaning something like 'useful wood', and referring to the material from which the canoe is built.⁵
 - The Gabrielino word for the sewn-plank boat, *tiʔat*, can be derived from a Polynesian word, **tia*, 'to sew'.
 - Another Gabrielino word for 'boat', *taraina*, can be derived from a Polynesian word,

³ At the time of this writing, most of Jones and Klar's papers are available online at Terry Jones's website, <http://cla.calpoly.edu/~tljones/>. In this paper I attribute linguistic arguments to 'Klar and Jones' and archaeological ones to 'Jones and Klar'. Summaries of their arguments are also published in Jones (2010), Klar (2010), throughout Jones et al. (2011), and in Jones and Klar (2012).

⁴ Jones and Klar's papers concentrate on contact between Polynesia and Southern California, but they also suggest contacts between Polynesia and the southern Chilean coast (A:461; D:93-94; E:179-180; Klar 2010; Klar 2011; Jones and Klar 2012). That topic is discussed more marginally; the linguistic part of it is brought up in paper D, but not in its revised version E. I will therefore not go into it in detail here. The linguistic argument suffers from similar weaknesses to the ones discussed here.

⁵ The single liquid consonant phoneme of Proto East Polynesian is sometimes marked as <R>, with an undetermined phonetic value reconstructed as either [r] or [l]. In the attested East Polynesian languages, [l] occurs only in Hawaiian, and early records show that [r] existed in Hawaiian as an allophone or a dialectal variant of that phoneme. I therefore reconstruct the PEP phoneme as [r]; this makes for clearer reading as well. Which liquid is reconstructed is not significant for this study, as has been noted by Klar and Jones (B:386), since all Chumashan languages have only one liquid, /l/, and either a Polynesian /r/ or an /l/ would be borrowed into a Chumashan language as /l/. The same argument applies to Gabrielino, which only has one liquid, /r/.

**taraina*, analyzed as **tarai*, ‘to hew, to carve’ + **-na* ‘nominalizer’, i.e., ‘carved object’.

- The above are explained by a scenario in which Polynesian voyagers have reached the American Pacific coast, and passed to the Native American populations the technology of planked boat construction along with related vocabulary, as well as particular fishhook styles.

I find that each of the arguments above is either flawed or entirely unsupported by the evidence, and that individually or together, they do not demonstrate Polynesian-American contact. I argue that the available linguistic, ethnographic and archaeological data point to a local origin for the planked boat of Southern California.

1.2 The Sweet Potato in Polynesia as an Example

That Polynesians have reached South America is established with certainty through the evidence of the sweet potato (*Ipomoea batatas*) and its native name (Yen 1974). The sweet potato, a South American cultivar, was present as a staple food crop throughout East Polynesia at the time of European contact, and archaeological evidence has indicated its presence centuries earlier (Hather and Kirch 1991; Higham and Gumbley 2001). The reconstructed Proto East Polynesian name of the sweet potato, *kumara*, is accepted as a borrowing of the form *kumar*, recorded in some dialects of Quechua, and more recently traced to the extinct Cañari language of the Ecuadorean coast (Scaglione 2005; Scaglione and Cordero 2011).⁶

The certainty given to the evidence of the *kumara*, even without any other evidence of trans-Pacific contact, rests on two factors. The first is uniqueness: there is no possibility that a species could have independently arisen in two different places, and the sweet potato, a cultivated plant, would need to be purposefully transported and planted to get from one place to another. Secondly, the linguistic argument is straightforward. The meanings of the South American *kumar* and of the Polynesian *kumara* are identical. The only formal change in the word is the addition of the final *-a* to the Polynesian form, where closed syllables are prohibited, a process ubiquitous in borrowings into Polynesian languages. The length of the word argues against chance similarity.

Taking the case of the sweet potato as a standard for establishing such prehistorical contacts, I examine the evidence given by Jones and Klar. Here the material evidence of boat construction and fishhooks does not meet the standard of uniqueness, in that the technologies were innovated independently elsewhere. The linguistic evidence given by Jones and Klar requires several unattested or unlikely formal and semantic changes, and so opens more questions than it answers. And finally, the material and linguistic evidence can all be better explained through a scenario of local development within California.

1.3 Plan of the Paper

I will first examine the claim for the uniqueness of the plank canoe and show that planked boat construction is more widespread in the Americas and elsewhere than Jones and Klar suggest, and will argue for independent innovation as the preferred explanation for the appearance of planked

⁶ Rensch (1991b) proposes that the Hawaiian form of the word, *?uāla*, may indicate a separate introduction of the sweet potato to Polynesia from a source further north on the South American coast.

canoe construction in Polynesia and the Americas.

Next, I will compare the techniques of planked boat construction by the Chumash and in East Polynesia. I will demonstrate that there is no clear evidence to link the two, and that differences in technique favor separate origins.

Next, I will examine issues of chronology, first of the appearance of the plank canoe in Southern California, then of Polynesian settlement in the eastern Pacific; I argue that the California plank canoe has either predated the Polynesian entry the Pacific, or else occurred very soon thereafter. This point is important in evaluating the linguistic arguments to follow.

I will then examine briefly the evidence for relating the Polynesian two-piece fishhook to the Chumash one, and will show that the two are unlikely to be related, based on chronological and stylistic arguments.

Moving to the linguistic evidence, I will first review the relevant issues in Polynesian historical phonology. I will then examine each of the American forms, and show that their claimed Polynesian sources are unlikely as such, on grounds of phonology, semantics, or both.

Finally, I will offer alternative etymologies for the Gabrielino and Chumash forms, and discuss other scenarios relating to the appearance of the planked boat in Southern California.

2 Technologies of Boat Construction in California

Broadly, three types of boat were built and used in California before European contact: tule bundle boats, wooden dugout canoes, and planked boats. Their distribution has been reviewed elsewhere (Cunningham 1989; Heizer and Whipple 1951:11-14; Heizer and Massey 1953). I will mention a few salient points and add more details toward the end of this paper.

The planked canoe, around which this discussion turns, has been described in great detail by Hudson et al. (1978), based on all known sources, but especially the notes of John P. Harrington. This boat, most commonly known by the Barbareño Chumash name *tomol*, was constructed of planks, which were usually split from logs of redwood which had drifted south from this tree's range in northern California. The edges of the planks were carefully glued together by a heated mixture of asphaltum and tree pitch, and then lashed tight by cords passed through holes drilled along the edges of the planks. The *tomol* was a large and seaworthy vessel, capable of reliably transporting people and goods between the mainland and the Channel Islands. These boats were used by the southern Chumash, on the coast facing the Channel Islands, by the Gabrielino further south along the coast, and by the Channel Islanders themselves. No similarly constructed boat appears elsewhere in California.

Tule boats (balsas) were widespread in California, and their distribution roughly complements that of dugout canoes (Kroeber 1922:267-269). They were constructed of several bundles of reeds (common tule, *Scirpus acutus*), each bound tight; one bundle would serve as a keel, and one or more bundles would serve to build up the boat on either side. Tule boats are relatively easy to construct in a short time, and the materials for their construction were easily available in the wetlands near where the boats would eventually be used, including the former Buena Vista Lake and Tulare Lake in the San Joaquin Valley, rivers throughout the Central Valley, and estuaries on the southern and central California coasts.

Tule boats were a significant form of water transport in coastal Southern California, though their significance has been overshadowed in the literature by the more elaborate and better-attested plank canoe. They were utilized for ocean travel by the Luiseño, Gabrielino, Chumash and Salinan people, and on beyond to the north and south. Tule boats were seaworthy enough to travel between the coast and the Channel Islands. The Chumash, and perhaps others,

sealed tule boats with asphaltum to waterproof them, which increased the time they could spend in the water before needing to be taken out and dried.

Dugout canoes are even more sparsely documented in the region. The Luiseño and Channel Chumash built dugout canoes, and likely the northernmost Chumash as well. Dugout canoes were historically used mostly for near-coast travel and fishing, but the Luiseño are said to have used them in earlier times for crossing to the southern Channel Islands. In historical times, at least, dugout canoes in Southern California were never as large or as ubiquitous as those of far northern California or the Pacific Northwest.

The Channel Islands were occupied by humans since the early Holocene (e.g., Rick et al. 2005). Since the archaeological evidence for plank canoes does not reach back more than one or two millennia, tule boats, dugouts or both must have been the predominant mode of oceanic transportation in Southern California for the past 10,000 years or so.⁷

3 Sewn Boat Technology: Worldwide Distribution

Linguistic issues aside, the argument for an external origin of the Chumash sewn plank canoe depends on the claim for its uniqueness in the Americas, or at least its rarity. Jones and Klar (A:461) state that the California plank canoe is the only example of planked canoe construction in the Americas, except possibly the *dalca* of southern Chile, and that the Chumash *tomol* is similar in details to Polynesian canoes in details of its construction. In this section, I show that sewn plank canoes are distributed worldwide, indicating multiple independent inventions of the technique. In particular, dugouts with sewn-on strakes, using a similar technique to fully planked construction, were used elsewhere in the Americas. Finally, despite Jones and Klar's claims, the Chumash *tomol* was significantly different in its construction from East Polynesian sewn plank canoes.

Sewn-plank canoes in the narrow sense — canoes built entirely of planks sewn together — existed in Ancient Egypt (the ship of Cheops, 2600 BC, McGrail 2004) and elsewhere in the Mediterranean, Western Europe and Northern Europe (the Ferriby boat, 1900 BC, McGrail 2004) well into northern Russia (Litwin 1985), in inland western Africa (Insoll 1993), the Indian Ocean, China and Japan (McGrail 2004), and possibly southern Brazil (M. Brindley 1924:129, following Bates 1873:36). The *dalca* of southern Chile (Cooper 1917:198-200; Latham 1930; Finsterbusch 1934; Heizer 1941b; Edwards 1965:21-34, Medina 1984; Puente 1986) was constructed of three planks, one serving as keel and the others serving as sides, and apparently originated with the Huilliche of Chiloé Island (Lothrop 1932). Another type of three-planked sewn boat is the *xodol* or *eksil'* of the Yukaghir of the Kolyma River, near the Arctic coast of eastern Siberia (Jochelson 1926:375-378; Mudge 1880:290), almost antipodally from the *dalca*.⁸

⁷ Fagan (2004) has suggested that plank canoes were present in Southern California for much of the Holocene. He does so by dismissing tule balsas as a viable means of transportation to the islands, which I consider unjustified, for the reasons discussed by Des Lauriers (2005). Cassidy et al. (2004:125-126) argue that Middle Holocene tool assemblages in the area are strikingly similar to those used for planked boat construction. Their argument is better, but still circumstantial and not conclusive, and is inconsistent with other evidence showing later appearance of the *tomol* (Arnold 2007:202).

⁸ Rousselot (1994:244-245) mistakenly states that the Yukaghir board canoe was an adaptation of Russian boats. In this he must refer to the *qarbas*, a sewn-plank canoe with a clearly European design and a borrowed name, rather than to the older 3-board design.

The technique of plank sewing was used to a less complete degree in built-up boats, that is, boats consisting of a dugout base or a keel with one or more rows of planks attached to its sides, so as to increase the boat's freeboard. Such boats were used by the Ainu of northern Japan (Ohtsuka 1999) and elsewhere in eastern Siberia (H. H. Brindley 1919-1920, II:104, III:139-140); and, in the Americas, in the Pacific Northwest (Kwakiutl, Boas 1909:334-337, 446; Haida, Stewart 1984:50 and Durham 1960:57, see also Howay 1941:207-208; Tlingit, Emmons 1991:84, 91), where the same technique was also used to repair cracks (Stewart 1984:45-47; for Coast Salish, Lincoln 1991:30); and in the Caribbean (McKusick 1960:5-7) and the Orinoco basin (Roth 1924:612-614, after Gumilla 1791, 2:113-116).⁹ In the Old World they are recorded from West Africa (Durand 1806:111), Russia (Litwin 1985) and elsewhere.

Both fully planked boats and dugouts with raised sides existed throughout Oceania, and in East Polynesia in particular (Best 1925; Haddon and Hornell 1936; Bataille-Benguigui et al. 2008). Where both forms existed, the choice of boat form depended on balancing the additional labor involved in building plank boats with the necessity of obtaining large logs for dugout bases (Haddon and Hornell 1936:345; Kamakau 1976:118).

The technique of sewing flat pieces of wood together into boats was also used in the construction of bark canoes, which employs bark peeled from trees, often as thick as planks split from a log. Sewn bark canoes were used at least in East Africa, Australia, Borneo, the Solomon Islands, northeastern North America, the Orinoco and Amazon basins, and Tierra del Fuego (Vairo 2002:97-125).

Lashing planks to each other side by side requires perfecting several techniques: truing the edges of the planks for a close fit; drilling holes; sealing the joints by calking them; and establishing a series of tight lashings which will not loosen or fall apart even after absorbing water. These techniques need to be established and relied on whether one attaches a single row of strakes to a dugout, builds a canoe of tree bark, or builds a fully planked canoe. Among American boat types, the Chumash plank canoe is hence much closer technologically to the built-up boats of the Pacific Northwest and the Caribbean than any of those are to a simple dugout, and the argument for the uniqueness of the *tomol* in the Americas is therefore weaker.

Anderson (2006:759-760), in his comment on Jones and Klar's original paper, mentions the wide use of sewn plank boats elsewhere in the world.¹⁰ Jones and Klar did not address this issue in their reply (C). Anderson does not describe just how widespread sewn boats are, and his argument veers toward advocating a different external source for the Chumash canoe. My

⁹ Jones and Klar, referring to the addition of strakes to Pacific Northwest canoes, comment that "When strakes or gunwales were added to the sides of these craft to increase freeboard, they were generally attached by mortising, not by sewing" (A:461). This is clearly not true in general, as seen in Boas's account of Kwakiutl techniques and in the other references mentioned here. On the other hand, Jones and Klar's quote comments by the eighteenth century observers, Crespi and Peña, about Northwest canoes made of 'several pieces'. These may well have referred to separate bow and stern pieces, not to raised sides.

¹⁰ Anderson (2006:760) distances the Chumash boat from Polynesian designs by drawing a distinction between fully sewn-plank boats (like the *tomol*) and built up boats with strakes sewn to a dugout base. As I argue here, that is a minor distinction, since the technique is mostly the same for both. In any event, early Polynesian voyaging canoes may well have been fully planked boats (e.g., Kamakau 1976:118), like those built in the Tuamotus through historical times (Haddon and Hornell 1936:67, 131 and elsewhere; Bataille-Benguigui et al. 2008). Polynesia, like almost every culture with seagoing tradition, had a great variety of boat types, specialized for different purposes and different effort of production.

argument is different: the more evidence there is for an innovation occurring independently many times, the stronger the argument is for the innovation occurring yet once more, and the lesser the need for external introduction as an explanation.

4 Sewn Boat Technology: Comparing the Details of Construction

Jones and Klar claim that "...tools, and techniques used in the construction of Polynesian sewn-plank boats are remarkably similar to those associated with the Chumashan *tomolo*," and enumerate what they consider parallels between the details of Chumash and East Polynesian canoe styles (A:465-466). I will examine these criteria, followed by the traits Prins (1986) uses in his typology of sewn plank canoes, and finally discuss several additional distinguishing technological traits.

Jones and Klar's comparative traits are:

- **Adze form.** "...hand-held adzes of nearly identical design (a short handle to which was lashed a shell blade) used as the primary tools to work planks. In the Tuamotu group, adzes were commonly made with clam shells as they were among the Chumash." This is not a significant trait. Short handles are universally necessary on carpenters' tools used for smaller work, and vice versa; this has no special connection with boat construction. The 'elbow adze', with a bent-down handle, was used by the Chumash for shaping wood; a similar form is widely distributed in northwestern North America (Olson 1927:7). Both stone and shell adzes were used in Polynesia and by the Chumash (Kamakau 1976:122; Hudson and Blackburn 1987:52), showing that both people, reasonably, used all the materials available to them as they found them suitable; this provides no evidence at all for cultural transfer. The details of adze form provide a valuable archaeological tool, and have been studied closely in Polynesia and elsewhere, but Jones and Klar give no details for comparing adze forms in these two areas, nor compare them to adze forms elsewhere; their claim of a 'nearly identical design' is unsupported.

- **Sandpaper.** "*Wood was finished with sandpaper — in Polynesia derived from a plant source, not the Chumashan sharkskin.*" A tight seal between joined planks depends on a precise fit. The final shaping of the joined surfaces was achieved in Polynesia by fine adzing (Haddon and Hornell 1936:135). Though sharkskin and coral rocks were known in Polynesia as sanding materials, I am not aware of any account of the use of sanding for shaping the matching edges of boat planks.

In Chumash technique, boat planks were first assembled and glued in place with pitch, before the final sewing. That required a particularly tight fit and smooth joint surface, which was achieved by polishing with sharkskin (Hudson et al. 1978:73, 75). The Gabrielino also sanded the outer surfaces of planks by weighting them down and dragging them on wet sand (Alliott 1917:42-43). Smoothing the outer surface of a canoe with sharkskin was also practiced in the Pacific Northwest (Stewart 1984:54). In other words, the use of sharkskin as sanding material is neither exclusive to Polynesia and the Chumash coast, nor is it universal in these areas. Sanding is a general woodworking technique, not especially linked with boat construction. There is nothing in sanding technique to connect Chumash and Polynesian boat-building.

- **Caulking tools.** "As among the Chumash, caulking in Polynesia was done with wooden caulking tools, although those of Hawaii were of more complex design." The Chumash caulking

tool was a wooden stick whittled at its end to a sharp edge, with which to force caulking material into the gap between planks. Similar tools were also made of bone (Hudson et al. 1978:41-42, and n. 56). There is nothing remarkable or unique about using wooden tools for such a purpose: the mere use of wood here does not imply a cultural connection.

- **Canoe sheds.** “Plank canoe construction in much of Polynesia was undertaken within a specially constructed canoe shed that protected the craft from the elements during its construction. This is very similar to the structure of mats and poles used by Chumash canoe builders for the same purpose.” To begin with, building shelters against the sun and the weather is a common activity in all human cultures. Their use in boat construction is not remarkable. More specifically, as Arnold (2007:203) has noted, Polynesian canoe sheds were large, permanent structures meant to completely enclose the boat under construction and protect it from the rain and the sun (at places evolving to the size of hangars, Haddon and Hornell 1936:328). The Chumash built small temporary frames of three poles and leaned a mat against them to protect the canoe from the sun, while the pitch used to glue its planks together was hardening (Hudson et al. 1978:44). The Chumash boat hut, as described, matches larger structures elsewhere in the area (e.g., Wallace 1978a:451) and indicates no external character. The purpose and form of the Polynesian and Chumash shelters were entirely different from each other. Jones and Klar (D, E) do not address this point as raised by Arnold.

In sum, none of the traits mentioned by Jones and Klar offer any support for Polynesian-Chumash contact. The traits they enumerate are either widespread, or are in fact not comparable.

Prins (1986) is an extensive comparative survey of sewn plank boat construction techniques worldwide. Although not quite complete in its coverage and details, it is the only work of its kind and scale. One of Prins’s aims was to select a small number of binary typological traits by which sewn planked boat traditions may be broadly distinguished, and use them to show the geographical distribution of different techniques. I note that Prins’s study focuses on highlighting world-scale patterns, and his traits are not always optimal for distinguishing boat building traditions within smaller areas. His four basic traits are: the presence (or absence) of continuous sewing; the presence of hole plugs; the presence of aligning dowels; and edge-to-edge versus overlapping plank construction. Their significance here is as follows:

- **Continuous sewing.** Continuous sewing is the practice of lacing a running cord back and forth through many pairs of drilled holes in adjacent planks. In discontinuous sewing, one short cord is passed through each pair of holes, tightened to pull the planks together, and tied off. In this regard East Polynesian canoes are clearly different from Chumash ones. The *tomol* was lashed with individual short cords, one for each pair of holes (Hudson et al. 1978:83-85), while continuous sewing was nearly universal throughout East Polynesia (Haddon and Hornell 1936 passim). Discontinuous sewing was used, however, elsewhere in Oceania, from Samoa westward, suggesting that continuous sewing was an East Polynesian innovation. Both continuously and discontinuously sewn boats occur in many parts of the world (Prins 1986:168).

- **Plugs.** In some plank sewing, a peg or plug is jammed into the hole after the cord was passed through it, in order to maintain the tension in the cord and provide additional sealing. This technique is not used in the Chumash canoe (Hudson et al. 1978:83-85). It was sometimes used in East Polynesia (Haddon and Hornell 1936:142), but not universally, and may be a later

innovation. It may have been developed in East Polynesia specifically for better tensioning of continuously sewn cords.

- **Dowels.** In some sewn plank boats, blind holes are drilled into the edges of the planks where they meet, and dowels are inserted, so as to align the planks and keep them from shifting past each other. Dowels were not used in East Polynesia, except perhaps in the largest Tuamotuan sewn plank canoes (Haddon and Hornell 1936:80). This technique may have been used in the construction of the Chumash *tomol* (Hudson et al. 1978:95), only in attaching the uppermost round of boards, and not always even then; the Chumash used dowels for other purposes, likely under European influence (Hudson et al. 1978:92-93). Horridge (1986:57-58, quoted in Pawley and Pawley 1998) notes that in western Oceania dowels were a later development, which generally followed the introduction of metal tools.

- **Plank positioning.** In overlapping ('clinker') construction the planks partly overlap each other, as they are joined face to face. Otherwise they are joined edge to edge. Polynesian and Chumash canoes are both edge-joined. This is not a diagnostic feature, since edge to edge construction is common worldwide, except mainly in Northern Europe and the Solomon Sea (Prins 1986:168).

Of Prins's four traits, The use of non-continuous sewing in the Chumash canoe weakly argues against a Polynesian connection. However, continuous sewing could conceivably be a late innovation which spread through East Polynesia after the time in question; in that case, this trait is not diagnostic. The other three of Prins's traits are not relevant here. In total, Prins's traits do not offer evidence in favor of Polynesian-Chumash contact.

Other distinctive traits not discussed by Jones and Klar or by Prins include:

- **Battens under cords.** In East Polynesian canoes, a long batten — a flat strip of material — was placed so as to cover the seams between the planks, and the cords would pass over the batten and hold it tightly in place. This provided further sealing against leaks, kept the caulking material within the joint, and helped to keep the lashing taut. This technique was used at least in the Marquesas (Handy 1923:157-158), Tuamotus (Haddon and Hornell 1936:58, 68, 69, 71, 89), Societies (Nordhoff 1930:145), the Northern Cooks (Haddon and Hornell 1936:178) and New Zealand (Best 1925:77; Haddon and Hornell 1936:202). Though widespread, the technique might not have been universal in the area. Battens were not used in Chumash boats.

- **Recessed groove (countersink) for cord.** In the Chumash canoe, grooves were carved into the planks between the holes, in which the cord could pass without projecting above the surface. This kept the cords from being abraded, and on the inside it prevented the rough cords from chafing against the skin of the crew (Hudson et al. 1978:82). Clearly, countersunk cords cannot be wrapped over battens as described above, and in fact countersinking was not usually used in East Polynesia (but see Best 1925:72 for countersinking when lashing together hull sections in Maori canoes).

- **Bent planks.** In Chumash boat-building technique planks were first cut and formed, then bent using heat and moisture (Hudson et al. 1978:68-72). This technique was never used in East Polynesia, where planks were shaped entirely by splitting and carving (Handy 1923:157; Henry 1928:549; Fornander 1917, 5:612).

- **Frame.** The Chumash canoe is built up of planks held to each other, without a supporting frame of ribs and with a single thwart, or cross-brace (Hudson et al. 1978:92); this is an unusual and distinct form of sewn plank construction. Of the fully planked canoes of the Tuamotus, the largest had frames (Haddon and Hornell 1936:80, 83). These very large boats presumably were close in design to the voyaging canoes which had voyaged to the American coast. Smaller sewn-plank boats of East Polynesia, closer in size to the *tomol*, did not use ribs or a frame, though they utilized thwarts.
- **Caulking.** In Polynesia, caulking — sealing the gaps between the planks — was done by placing between the planks fibrous matter, typically coconut fibers with breadfruit juice, which would then be compressed as the planks were lashed together. The Chumash, on the other hand, used *yop*, heated asphaltum diluted with tree sap, which would fill the gap between the planks and then harden. Secondary caulking was of tule was added along the of the joints and sealed with more *yop*. Gamble (2002:307) has found traces of asphaltum on the edge of canoe planks from every archaeological context she studied, including one dated to the late first millennium AD. The Chumash use of *yop* goes beyond mere caulking, in that it has a significant structural function. Each round of planks of the Chumash boat was assembled by gluing the planks to the lower round using *yop*, and sewing them together only after it has hardened. This technique no doubt owes its origin to the availability of asphaltum in Chumash territory, and is possibly unparalleled anywhere else; certainly it is quite different from Polynesian technique.

The above five traits all represent techniques, some clearly beneficial, which are not clearly shared between East Polynesia and Southern California. Several of these characteristics can be noticed in a few minutes inspection of a finished boat, and could have easily been transferred to the Chumash even through brief and casual interaction. By the simplest interpretation, the difference in technologies argues against a Polynesian origin for the Chumash canoe. Of course, the Chumash and Polynesian canoes of AD 1800 are no doubt different than those of, say, AD 1000, and some of the technologies discussed here may be later developments. Even so, there are no distinctive traits shared by the two areas. At best, the the evidence of boat-building techniques provides no proof of the Polynesian-Chumash contact hypothesis. At worst, the evidence disproves it.¹¹

Beyond the specifics of planked canoe construction, Anderson (2006:760) and Arnold (2007:203) have already pointed out other characteristics of Oceanic boat construction absent from the Chumash canoe, namely outriggers or double hulls, which add stability, and sails. Jones and Klar (C:766) deflect this argument by saying that the Chumash, for whatever reason, have chosen not to adopt these elements. Elsewhere (A:469) they suggest that perhaps the lack of suitable sail material kept the Chumash from adopting that technology, and the double hulled boats were too complex to copy. This is a weak argument, absent any convincing reasons why the Chumash would ignore these elements while adopting other complex technologies. As above, this argument at best trades counterevidence for lack of evidence.

¹¹ Robinson (1943:17) also sees no connection between Chumash and Oceanic boatbuilding techniques, but provides no details. Heizer (1940:83-88) examines in detail several details of construction in the Chumash and other plank boat types of construction. He concludes that the Chumash boat was an independent innovation, which he believes evolved from the design of the tule boat.

5 Archaeology: Chronological Issues

At best, the inferred dates for the appearance of the Chumash canoe and the initial settlement of East Polynesia are uncomfortably close. The very closeness of the dates would fit nicely in a scenario of rapid settlement of the eastern Pacific, culminating with American contact soon thereafter. However, if the Chumash canoe turns out to have appeared even slightly before humans had reached East Polynesia, this would clearly rule out Polynesian contact as its source. Therefore, the knowns and the uncertainties in both dates have to be well understood. Additionally, if the Chumash canoe was indeed developed after the settlement of East Polynesia, the chronology turns out to narrow down the details of the language of the Polynesian populations which could have landed in California. This aids the analysis of the proposed Polynesian etymologies.

5.1 The Chronology of Settlement in East Polynesia

Polynesians were the first people to inhabit the islands of East Polynesia, also referred to as triangle Polynesia — most of the area encompassed by Easter Island, Hawaii, and New Zealand — and they reached them from the west, in the final stage of the Austronesian expansion. The dating of the initial settlement of East Polynesia, or of any of its islands, is an active field of research. Jones and Klar (A:461, 477; C:767-768; D:92-93; E:179), and the critiques of Anderson (2006:760), and Arnold (2007:202-203) touch on these issues; I review here the history of East Polynesian settlement chronology and its current status in greater detail.

Radiocarbon dating has been utilized in Polynesian archaeology since soon after its invention in the late 1950s, and remains the tool of choice for obtaining absolute dates. Early on, a sequence of settlement dates emerged for the major East Polynesian island groups, and was used together with archaeological and linguistic evidence to evolve what Kirch (1986), in a detailed review, called the “orthodox scenario”. In that scenario, East Polynesian settlement started with the settlement of the Marquesas from West Polynesia around AD 300, progressing to the rest of East Polynesia in the following few centuries, up to the settlement of New Zealand in AD 800-1000 or earlier. Some variations on the model called for even earlier East Polynesian settlement dates, as early as the first millennium BC. This model, with some modifications, was the predominant one from the 1960s to the 1990s, and still occasionally appears in the literature.¹²

Early models of East Polynesian settlement chronology were anchored by relatively few radiocarbon dates of the first millennium AD, and a few even earlier ones, in East Polynesia as a whole as well as in individual island groups, in contrast with much more abundant post-AD 1000 dates. This paucity of older samples was usually taken to show small initial populations growing slowly, and so producing fewer datable artifacts, which with greater age would also be less likely to have survived.

A decisive turn in Polynesian chronology came with Atholl Anderson’s work, beginning with Anderson (1991). In it he examined the entire corpus of radiocarbon dates existing for New Zealand, then thought to have been settled sometime in the first millennium AD. Anderson applied what is known as chronometric hygiene, systematically rejecting samples based on a set

¹² Jones and Klar refer to “the era of greatest Polynesian exploration (ca. A.D. 500-1000)” (A:461) and “the era when Polynesian seafarers discovered the most distant outposts of the Pacific (A.D. 500-1100)” (A:477). They quote no source for these dates.

of internal criteria (such as materials prone to producing erroneous dates) and external ones (such as samples with aberrant ages among others from the same context).¹³ Without these questionable samples a large set of dates still remained, but showing no dates earlier than the twelfth century AD, and abundant later dates. This suggested a model significantly different than the ‘orthodox scenario’; here New Zealand was not settled until the twelfth century, and its population grew rapidly after settlement. Conversely, this study has shown that earlier New Zealand dates are all likely the result of technical errors. Subsequent studies have shown strong evidence for an even later settlement date, in the late thirteenth century (Hogg et al. 2003, Wilmshurst and Higham 2004, Wilmshurst et al. 2008), further weakening the remaining arguments for early settlement (Sutton et al. 2008; see also Butler 2008 and Matisoo-Smith et al. 2008).

The successful revision of New Zealand settlement chronology was extended by the same principles beyond New Zealand as well. Spriggs and Anderson (1993) applied the procedures of chronometric hygiene to the rest of East Polynesia, resulting in a similar rejection of many early dates, and tentatively estimated the settlement of East Polynesia at AD 600-950, based on several dates with large uncertainties. Since then, abundant additional work has consistently reinforced later chronologies throughout East Polynesia. Moreover, new techniques of sample selection, preparation, measurement and correction, not available in the first wave of East Polynesian chronometry (Spriggs 2010), have failed to turn up early first millennium dates, and several claimed early samples and sites were shown to be of a younger age (Kirch and Kahn 2007:198-201).¹⁴ Even some supposedly early sites which passed the criteria of Spriggs and Anderson (1993) turned out on fresh reanalysis to be much more recent (Anderson and Sinoto 2002; Kirch and Kahn 2007:199; Dye and Pantaleo 2010). Additional support for these shorter chronologies comes from recent geological studies (Pirazzoli and Montaggioni 1988, Dickinson 2003, 2009), which show that some islands were still submerged or otherwise not habitable during the times suggested by some earlier chronologies. A review of the literature by Kirch and Kahn (2007:201) puts initial East Polynesian settlement at no earlier than AD 800. Weisler and Green (2011) place it at ca. AD 800. Finally, Wilmshurst et al. (2011), following the chronological hygiene methodology of Spriggs and Anderson but employing more accurate and far more abundant data, places the earliest settlement of East Polynesia at about AD 1000.

While unknowns and controversies remain, the extent of the debate has shrunk. Initial settlement of East Polynesia not much earlier than AD 1000 is now generally accepted, and the controversies cover a range of a few centuries rather than a millennium.¹⁵ Data from some island groups are sparse, and chronometric data cannot yet be used to resolve the order in which they were settled, with a few exceptions. In addition, the interpretation of environmental proxies for early settlement, particularly pollen and charcoal records from wetland deposits, remain hard to interpret and less decisive. While earlier chronologies in the region continue to be argued (Sutton et al. 2008; Kirch and Ellison 1994, see also Anderson 1994), they are at this point on the decline. To call the shorter chronologies ‘controversial’, as Jones and Klar do (D:92, E:179) is an exaggeration, as is their claim that “there is no consensus on the proposed short chronology for

¹³ The term ‘chronometric hygiene’ is due to Wilfred Shawcross, and was popularized by Spriggs (1989).

¹⁴ Polach (1976) is an older but very useful survey of radiocarbon measurement and its pitfalls.

¹⁵ In one recent paper, the authors disagree among themselves whether a settlement date of ca. AD 800 or ca. AD 1000 is a better fit to the chronometric data for one island group (Anderson et al. 2003:137). This is fairly representative of the current range of opinions for the initial settlement date of East Polynesia.

eastern Polynesia” (C:768).¹⁶

In Hawaii, a departure point for California suggested by Jones and Klar, no clear evidence exists for human presence before AD 1000. Three recent regional syntheses — Athens et al. (2002) for the ‘Ewa plain in southern O‘ahu, Carson (2006) for Kaua‘i, and McCoy (2007) and Kirch and McCoy (2007) for Moloka‘i — independently find no certain dated evidence for human presence in their particular areas before ca. AD 1000, and Wilmshurst et al. (2011) and Rieth et al. (2011) place Hawaiian settlement at no earlier than AD 1200.¹⁷ To support an early date for Hawaiian colonization, Jones and Klar (C:768, D:92-93, E:179) quote a single datum from the compilation of Spriggs and Anderson (1993:202). That date, Beta-30860, is from a sample from the Honokaua site in Maui. Its calibrated date interval is AD 650-770 (1 σ , uncalibrated date 1330 \pm 60 BP). There are no other accepted samples in Spriggs and Anderson’s compilation whose entire 2 σ calibrated range falls earlier than AD 1000, or whose entire 1 σ range falls earlier than AD 800; in other words, none of them decisively indicates a pre-AD 800 presence.¹⁸ Jones and Klar’s claim here rests heavily on this single sample. This sample comes from charcoal of an unidentified plant source (Theresa Donham, p.c. 2010), and could therefore be of a wood significantly older than its time of deposition. Jones and Klar’s argument, already chronologically precarious, can not safely depend on a revision of Hawaiian chronology based on this single questionable date.

In their later papers Jones and Klar suggest Central East Polynesia as another possible departure point for California, apparently to better accommodate the linguistic evidence. Central East Polynesia must have been reached before Hawaii, but apparently not by much. There is no direct unquestioned evidence for human presence anywhere in East Polynesia before ca. AD 800 in earlier scenarios (Kirch and Kahn 2007) or AD 1000 in the more recent ones (Wilmshurst et al. 2011).¹⁹ The overall picture is of rapid settlement of East Polynesia beginning not much earlier than AD 1000, over a period of a few centuries. This is comparable to the span of time over which the first European explorers reached all the Pacific archipelagos, though of course the circumstances of discovery were different in the two cases.

In sum, the emerging consensus, stated twenty years ago and bolstered and refined since by additional data, is that Central East Polynesia and Hawaii have been reached and settled not much earlier than AD 1000. Polynesians could not have been the source of the Chumash plank canoe if it appeared earlier than that time.

¹⁶ Even shorter chronologies for Easter Island settlement were proposed by Hunt and Lipo (2006, 2008), on the basis of chronological hygiene, and mentioned by Jones and Klar as examples of short chronology controversies. Hunt and Lipo’s Easter Island settlement date (ca. AD 1200) is indeed even younger than other recent estimates (pre-AD 1000, Martinsson-Wallin and Crockford 2001; Weisler and Green 2011). However their arguments do not directly affect the chronology for Central East Polynesia or Hawaii, and are separate from them.

¹⁷ Dye (2011) argues for moving the Hawaiian settlement date back, perhaps to ca. AD 1000. His argument relies on including in the radiocarbon corpus two dates rejected by Wilmshurst et al. (2011), one from a Kukui nut and one from a rat bone. Rat bones are notoriously hard to date correctly (e.g., Anderson 2000, Wilmshurst et al. 2008), which leaves the revision dependent on a single date.

¹⁸ 1 σ ranges were calculated from the data of Spriggs and Anderson (1993) using CALIB 5.1 (Stuiver et al. 2006).

¹⁹ Kirch and Kahn’s early date, AD 780-1000 (cal 1 σ) has been presented for Henderson Island (Weisler 1993:210 and Weisler 1994); however, this is based on unidentified charcoal and may represent old wood.

5.2 Dating the Appearance of the Chumash Plank Boat

The accepted dates for the appearance of Chumash plank canoe derive from two sources: artifacts, in the form of drilled planks, and the remains of fish thought to have been caught from plank canoes.

Gamble (2002) is the most recent work on the dating of plank boat-related physical artifacts. The older of her two dates for clearly identified canoe planks is AD 625-700 (cal 2σ ; CA-SMI-261, Daisy Cave, San Miguel Island). However, as she points out, this plank is from driftwood, and is subject to the old wood effect: if redwood (*Sequoia sempervirens*) or other large tree species was the source of this plank, the driftwood log used for making the plank could have been hundreds of years old when the plank was made. This date is thus of little value for distinguishing a definitely pre-Polynesian, pre-AD 800 *tomol* from one definitely later than Polynesian settlement. The other canoe plank dates to no older than the fifteenth century AD.

Other canoe planks, as well as stone drills possible used for plank drilling, have also been identified in a burial from the cemetery of Simo'mo. This burial was assigned to as phase 4 (M4) of the Middle period of the cultural sequence of King (1981), or possibly as early as M3.²⁰ M4 is bracketed chronologically by dates known to belong to the preceding phase M3 and the younger phase M5a (King 1981: 47, 59, 64), and the chronology is further reinforced by dates associated with California beads found in the desert Southwest, hundreds of kilometers inland. King places the boundaries of M4 around AD 700-900. However, one artifact assigned to M5a yielded a radiocarbon date of AD 690-860 cal 1σ (1246 \pm 60 BP; UCLA 1886).²¹ If this date is correct, it would shift the M4/M5a boundary to the early ninth century, and make it likely that the M4-era Simo'mo planks are older than AD 800. The invention or introduction of the *tomol* would be older still.

The advent of the Chumash plank canoe can also be estimated using the proxy of fish remains (Bernard 2001, 2004; Arnold and Bernard 2005). In particular, swordfish (*Xiphias gladius*), shortfin mako shark (*Isurus oxyrinchus*) and tuna (*Thunnus* sp.) remains are considered to be a strong indicator of *tomol* fishing, as any other boat known to have existed in the area would be too small to handle these strong, determined fish or to haul them back to shore (Bernard 2001:21-29). Bernard (2001) has assembled records of remains of what she considers 'tomol-acquired species' and correlated them with dated strata from a variety of known sites.

In Bernard's 'high resolution' data set (Bernard 2001:65-70) there are four sites with reasonable stratigraphic control containing apparently pre-AD 900 remains of *tomol*-acquired species. SMI-481 (Otter Point, San Miguel Island) yielded a few swordfish vertebrae, from a context dated to AD 730-800 (range of medians of calibrated dates), based on the data of Rick

²⁰ The cultural seriation of King (1981) is based on the analysis of bead ornaments in funerary contexts.

²¹ Both dates used for bracketing M4 are on human bone collagen samples. They are thus free from issues of old carbon. However, human bone collagen may appear too old by several decades if it came from people with a significantly marine-based diet (Polach 1976; Walker and DeNiro 1986). King (1981) provides no other details of sample preparation protocol. The oldest M5a sample, UCLA 1886, is reported as "a radiocarbon date on collagen from Burials 35 and 36 from LAn-264" (King 1981:64); this was apparently a commingled burial (Chester King, p.c. 2010). The dates are calibrated here using CALIB 5.1 (Stuiver et al. 2006), assuming the raw dates are corrected for fractionation appropriate for bone collagen. If not, a fractionation correction of 80 \pm 35 years (Polach 1976:268) would make UCLA 1886 older by several decades. King (1981:64) gives the calibrated date of UCLA 1886 as AD 730-790 and comments on the discrepancy with his chronology.

(2004).²² LAN-52 (Arroyo Sequit, west of Malibu) has some remains of tuna from a layer dated to AD 600-750 (1 σ , 1340 \pm 100 BP), with more at lower strata ca. 100 years older, by extrapolation using an estimate for the deposition rate. This date was obtained in 1963, and details of sample selection and preparation are not given; its accuracy is therefore questionable. Another site, LAN-227 (Century Ranch) yielded tuna remains from strata dated to the seventh century. This date, again, is obtained by interpolation based on depth and on imprecise and possibly uncalibrated radiocarbon dates from the early 1960s. A fourth site, SBA-72N (Tecolote Canyon, near Santa Barbara), yielded a single tooth of a shortfin mako, with an associated date of ca. AD 500; I consider this find too inconclusive. Bernard (2001:105) synthesizes her findings into a significant increase in *tomol*-caught species beginning around the 8th-9th centuries AD; she reads the gradual slow increase in the remains of such fish as indicating a period of refinement in boat-building technology.

One particularly spectacular swordfish remnant is the swordfish dancer's mask described by Davenport et al. (1993). The mask is assembled from a swordfish skull, and attached to a cape of abalone shells. An 'ornament' (apparently of mother-of-pearl) from the cape was used to obtain a corrected radiocarbon date of 2040 \pm 90 BP, which yields a calibrated date of AD 480-680 1 σ or AD 380-780 2 σ (Stuiver et al. 2006, $\Delta R=230\pm 35$); I note that the shells used for the cape may have been old ones collected inland, and so the cape may be younger than the shells. Jones and Klar (C:767) correctly point out that this cape is younger than the uncorrected radiocarbon age would indicate.

In sum, the canoe plank remains of Simo'mo indicate the presence of plank canoes ca. AD 900 or before, with some uncertainty. The evidence of fish remains points at an earlier time for appearance of the *tomol*, but depends on more uncertain interpretation and less reliable dates. The current data for the Simo'mo cemetery and for the fish remains sites are consistent with the appearance of the *tomol*, by a very rough estimate, no later than AD 800 and probably a century or more earlier.

5.3 Chronology: Discussion

To summarize the chronological issues: there is substantial direct evidence for human presence in Central East Polynesia and Hawaii after AD 1000, and only circumstantial and uncertain evidence for such before AD 900. In Chumash country, there is some evidence for the plank canoe existing by AD 800 or even AD 700.

Both these date estimates suffer from uncertainties. Earlier dates may yet be found in East Polynesia, though earlier remains of Chumash plank boats may be found as well. Much of Chumash boat chronology is based on uncertain dates and overreaching assumptions. Better data from both areas may confirm and strengthen the current chronologies, or provide new chronologies with dates moved either forward or back. For now, the likelier conclusion is that the Chumash plank canoe predated the presence of Polynesians in the east Pacific and the Americas by a century or two, and that the two are therefore unrelated. A less likely, but currently still tenable position, is that Polynesians settled East Polynesia at about the time the

²² See also Erlandson et al. (2005). At the time Bernard (2001) was written, these data were still unpublished. Rick (2004:147-149) identifies the remains of what are apparently three Swordfish or Marlin vertebrae from his unit 1a/1b. Three calibrated dates were obtained from the unit (Rick 2004:134, also Erlandson et al. 2005), roughly AD 970 \pm 70, AD 795 \pm 85 and AD 740 \pm 50 (1 σ corrected).

tomol first came to be. That would require finding compelling evidence for pushing the dates associated with the plank canoe a century or more toward the present, and East Polynesian settlement a century or more back, to converge on a date of, say, AD 800-850. Jones and Klar have attempted to push both these chronologies in that way, but have not conclusively succeeded (C:768; D:92-93; E:178-179).

For the rest of my discussion here, I will adopt this second, less probable, position: that East Polynesia had been first settled just before the plank canoe appeared in California. By implication, any Polynesians arriving then in Chumash territory would manifest the culture and language reconstructed for ancestral East Polynesia. This point is used below in evaluating the evidence of fishhooks and the linguistic evidence.

6 Archaeology: The Evidence of Fishhooks

To support their scenario, Jones and Klar compare the forms of a particular style of fishhook, the two-piece fishhook, from East Polynesia and Southern California. This fishhook is assembled of two parts: a barb, which hooks the fish, and a shaft, which connects to the fishing line (Hudson and Blackburn 1982:179-181; Kirch 1985:200-203). The two parts are tied together at the bottom with cordage, and in California are also glued with asphaltum. The fishhook barb, often made of bone or shell, may be well-preserved in archaeological contexts. Jones and Klar (A:466-468, C:766-767) do not claim the Chumash two-piece fishhook is a Polynesian import; they only associate a more curved, s-shaped form of the barb with similarly shaped fishhook barbs of Polynesia, which they believe were the model for the Chumash ones.

Artifacts which may be interpreted as two-piece fishhook barbs appear relatively early in the Chumash archaeological record, in King's phases M2b and M3 (200 BC-AD 300 and AD 300-700 respectively, King 1981:47), and are uncontroversially a local development. The curved form in question is recorded from as early as phase M5 (AD 900-1150). No two-piece fishhook barbs are recorded from M4 contexts. These data, though fragmentary, are consistent with a transition to the curved form of fishhook some time during M4 or early M5. Jones and Klar associate it with the appearance of the *tomol*, at roughly that time.

However, the East Polynesian two-piece fishhook did not yet exist then. It is recorded from the margins of East Polynesia: Easter Island, New Zealand, and Hawaii; in Hawaii, the curved form mentioned by Jones and Klar appears only late in the chronological sequence (Kirch 1985:205-207; Emory et al. 1959:26). It does not appear at all in the archaeological record from Central East Polynesia (Sinoto 1979:125). It is believed that it was innovated later, and separately, in those three marginal locations. The most common ancestral East Polynesian fishhook was made of one piece, carved from a single round shell. Kirch and Green (1987:173) cite the two-piece fishhook as an example of convergent technological evolution: it was developed in Polynesia where strong shell material was not available for producing the older one-piece style of fishhook. Other examples of the independent invention of similar fishhooks are known from the Baltic region (Anell 1995:195, fig. 20), even showing the curved barb which Jones and Klar regard as a distinctive trait linking Polynesia and Southern California. In sum, chronology and geographical distribution argue against the Chumash fishhook originating in Polynesia, and the independent historical emergence of formally similar fishhooks within Polynesia and worldwide agrees with their independent development in California, with a similar functional motivation.

Notably, the one-piece circular shell fishhook also appears in very similar styles in Chumash country and in East Polynesia. Several have suggested this striking similarity as evidence for

trans-Pacific cultural contact (Rau 1884:138; Olson 1930:21; Kroeber 1939:44; and others). However, as Jones and Klar have already discussed (A:459, 466), the oldest Chumash circular fishhooks predate East Polynesian colonization by millennia, and are therefore unrelated. The methodological lesson here is to use caution in equating artifacts based on formal similarities, however striking. This is especially true with items whose form is mostly functional, such as fishhooks; I believe that this applies to sewn-plank boats as well.

7 East Polynesia: Historical Linguistics

The Polynesian language family is a typologically close family of several dozen languages and dialects. It and its nearest relatives, the Fijian languages and Rotuman, make up the Central Pacific language family. The subgrouping of the Polynesian languages is mostly uncontroversial, and its accepted subgroups have been supported by a large and growing body of grammatical and lexical evidence (Green 1966, 1985; Pawley 1966; Howard 1981; Wilson 1985; Marck 1996, 2000).²³ The following sketch summarizes an accepted subgrouping of the Polynesian languages, omitting some languages irrelevant to this discussion and some less established subgroupings:

POLYNESIAN

TONGIC

Tongan

Niuean

NUCLEAR POLYNESIAN

East Futuna, East Uvea, Rennellese, Tikopia, Pukapuka, various other languages of Western Polynesia and Vanuatu

ELLICEAN

Sāmoan, Tuvaluan [Tūvalu (Ellice islands)], **Luangiua, Takuu, Sikaiana** [Solomon Islands], various other languages of Vanuatu, the Solomon Islands and Micronesia

EAST POLYNESIAN

Rapanui [Easter Island]

CENTRAL EAST POLYNESIAN

MARQUESIC

Hawai'ian

Marquesan [dialect complex, divided into North and South Marquesan]

Mangarevan

TAHITIC

Tahitian [Society Islands, including Tahiti]

Tuamotuan

Austral languages: Rimatara, Rurutu, Tupua'i (Tubuai), **Ra'ivavae**²⁴

Māori [New Zealand. Several dialects]

Cook Island Māori: Rarotongan, Mangaian, Aitutaki, Tongareva

²³ Recent work (Walworth 2012) questions the validity of Marquesic and Tahitic as valid taxons. The arguments in this paper do not rely significantly on that part of the classification.

²⁴ The position of the closely related Austral languages within Tahitic is unclear, as they are poorly documented and have been heavily influenced by Tahitian since European contact.

(Penrhyn) and other closely related languages]

All Polynesian languages have a small phonemic inventory, of which only the stops and the nasals matter to this discussion.²⁵ Proto Polynesian had the stop consonants **p*, **t*, **k* and **ʔ*, and the nasals **m*, **n*, and **ŋ*. The PPN bilabials **p* and **m* are unchanged in all the Polynesian languages.²⁶ The following discussion is based on Marck (2000), Biggs (1978), Hovdhaugen (1986) and Fischer (1999).

The three non-bilabial stops participate in a pull-chain shift, $\emptyset < *ʔ < *k < *t$, which has progressed to some stage in nearly every Polynesian language. Examples of the stages of this chain shift are given in table 1. Each set of reflexes here indeed corresponds to a stage in the pull-chain: no language has shifted **k* to *ʔ* until after **ʔ* had been lost, and no language has shifted **t* to *k* until after **k* had shifted to *ʔ*. The **t > k* shift in Hawaiian is late, and has not affected most of Hawaii until the nineteenth century, progressing from east to west (Blust 2004). This shift has a similar history in Samoan, where it is at present only reflected in the colloquial register (Blust 2004; Hovdhaugen 1986).

Stage	<i>*p</i>	<i>*t</i>	<i>*k</i>	<i>*ʔ</i>	Languages
I		<i>t</i>	<i>k</i>	<i>ʔ</i>	Rapanui, Tongan, East Uvea, East Futuna, Rennellese; Proto Polynesian (PPN), Proto East Polynesian (PEP)
II		<i>t</i>	<i>k</i>	\emptyset	All Polynesian languages not elsewhere in this table, including North Marquesan, Mangarevan, Maori and Niuean; Proto Central East Polynesian (PCE)
III	<i>p</i>	<i>t</i>	<i>ʔ</i>	\emptyset	Hawaiian (modern Ni‘ihau and most older dialects), South Marquesan, Tahitian (standard), Austral languages, Samoan (formal)
IV		<i>k</i>	<i>ʔ</i>	\emptyset	Hawaiian (modern standard and some old Hawai‘i dialects), Tahitian (western dialects), Samoan (colloquial), Luangiua

Table 1: Reflexes of Proto Polynesian stops in the Polynesian languages. The stages of the chain shift are numbered here to highlight the chronological progression.

As for the nasals, PPN **n* has persisted as *n* in all Polynesian languages except Luangiua and Colloquial Samoan, where its reflex is *ŋ*, merging with that of PPn **ŋ*. PPn and PEP **ŋ* is reflected as *ŋ* in most Polynesian languages, with the following exceptions: **ŋ > n*, merging with **n*, in Hawaiian, South Marquesan, the Bay of Plenty dialect of Maori, and the Austral languages of Rimatara and Tubuai; **ŋ > k*, merging with **k*, in North Marquesan (except in Taipivai on Nuku Hiva), and in South Island Maori; and **ŋ > ʔ* in Tahitian. It is possible that Tahitian **ŋ* had once merged with **k*, as in North Marquesan, followed by the plosive shift **k > ʔ* as described

²⁵ Other sound changes which affect various East Polynesian languages are *s > h* (all except Tongareva), *f > h* (various), *h > ʔ* (Mangarevan, Rarotongan, some Austral languages) and *r > ʔ* (Marquesan). Sound changes are of little use in the subgrouping of the Polynesian languages, since many of them recur independently in separate branches of the family.

²⁶ I use the following standard abbreviations: PPN (Proto Polynesian); PEP (Proto East Polynesian); PCE or PCEP (Proto Central East Polynesian).

above.

<i>*m</i>	<i>*n</i>	<i>*ŋ</i>	Languages
	<i>n</i>	<i>ŋ</i>	All Polynesian languages not elsewhere in this table
	<i>n</i>	<i>k</i>	North Marquesan (except Taipivai), Ngāi Tahu (S. Island) Maori
<i>m</i>	<i>n</i>	<i>ʔ</i>	Tahitian, Rurutu
	<i>n</i>		Hawaiian, South Marquesan, Bay of Plenty Maori, Rimatara, Tubuai
	<i>ŋ</i>		Colloquial Samoan, Luangiua

Table 2: Reflexes of Proto Polynesian nasals in the Polynesian languages

Some degree of documentation exists for nearly all Polynesian languages, and extensive dictionaries exist for many.²⁷ POLLEX (Biggs and Clark 1993) is an extensive comparative lexical database of the Polynesian languages, maintained since the 1960s, and an invaluable tool in Polynesian comparative linguistics.²⁸

8 Terms for ‘boat’ in Southern California: The Documentary Evidence

In this section I will review the sources for the Californian words for ‘boat’ under discussion, so as to start from reliable and precise phonetics and semantics, as far as sources allow.

8.1 The Gabrielino Record

Gabrielino was spoken in what is now the Los Angeles basin, adjacent inland valleys, and the southern Channel Islands. It belongs to the Takic language family; Takic is a subgroup of Northern Uto-Aztecan, along with Numic, Tübatulabal, and Hopi. The Takic languages all are or were spoken in Southern California. The following chart omits a few poorly documented languages not germane to the discussion.

TAKIC

SERRAN

Serrano [San Bernardino Mountains and adjacent Mojave Desert and inland valleys]

Kitanemuk [Western Tehachapi Mountains, SE Central Valley, Antelope Valley]

GABRIELINO

Gabrielino proper [Los Angeles basin south past Newport Bay, and inland valleys]

Fernandeño [San Fernando Valley]

CUPAN

LUISEÑO [Coast from south of Newport Bay to Carlsbad, and adjacent mountains]

²⁷ Standard dictionaries used in this paper are: Rapanui — Englert (1978); Fuentes (1960); Hawaiian — Pukui and Elbert (1986); Marquesan — Dordillon (1904); Mangarevan — Rensch (1991a); Tahitian — Andrews and Andrews (1944); Maori — Williams (1971); Cook Island Maori — Buse and Taringa (1995); Mauriati et al. (2006); Shibata (2003); Tuamotuan — Stimson (1964). Other sources are mentioned as necessary.

²⁸ Klar and Jones refer to the 1994 version of POLLEX. The 1993 version, which I use, is not substantially different (Marck 2000:6). An updated version is available online at <http://pollex.org.nz>.

- Luiseno** proper [Southern coastal part of the above and mountains]
Juaneño (Acjachemem) [Northern coastal part, around San Juan Capistrano]
 CAHUILLA-CUPEÑO
Cahuilla [Inland area, from San Bernardino to Salton Trough]. Three dialects:
 Pass Cahuilla (Wanikik) [San Gorgonio Pass]
 Desert Cahuilla [Coachella Valley]
 Mountain Cahuilla [Santa Rosa and San Jacinto Mountains]
Cupeño [Around Warner Springs, near San Luis Rey River headwaters]

Fernandeño was one of several closely related dialects of Gabrielino, accorded its own name through the presence of the mission at San Fernando. Juaneño, likewise, is closely related to Luiseno. Serrano and Kitanemuk were mutually intelligible.

All Takic languages are largely suffixing languages. Isolated, non-possessed nouns take one of several language-specific and lexically determined suffixes, known in the Uto-Aztecan literature as absolutes. Possessed nouns take a possessive prefix and omit the absolute suffix, e.g., Luiseno *'hu:-la* {arrow-ABS} 'arrow', *no-'hu:* {1SG-arrow} 'my arrow' (Elliott 1999:22). The historical phonology of Takic is fairly well understood (Bright and Hill 1967; Langacker 1970; Munro 1990; Hill 2007; and others).

Gabrielino is poorly documented. Some of the what is known about the language comes from several early wordlists (Hale 1846; Taylor 1860c; Gatschet 1879 — all published in McCawley 1996; Kroeber 1907, 1909), of varying phonetic quality. The greatest amount of information of the language comes from two indefatigable linguists-collectors of the early twentieth century, C. Hart Merriam and John P. Harrington, both of whom documented otherwise barely-known languages. Merriam collected extensive wordlists for Gabrielino (and other languages), including words for precisely identified animals and plants.²⁹ While his vocabulary is the largest existing lexical resource for Gabrielino, his orthography was phonetically naive, and his transcriptions were imprecise, inaccurate and inconsistent. Harrington's notes, while covering somewhat less lexical material, are extensive, phonetically accurate, and detailed.³⁰ Most of Harrington's materials are unedited and unpublished, but Munro (2000) includes many elicited sentences from his notes, and Bright (1976) contains basic vocabulary based on his notes.

8.2 The Gabrielino Record: *tarainxa*

One Gabrielino word for 'boat' is known from the following records:

<traínxe>	'canoe; boat'	[Hale 1846; McCawley 1996:282] ³¹
<Ta-rin-ha>	'canoe, boat'	[Taylor 1860c; McCawley 1996:272]
<Tah-rī'ng-hah>	'boat (bundles of tules)'	[Merriam 1903a; McCawley 1996:246]

²⁹ Merriam's notes, digitized from the microfilm, are available at <http://www.archive.org>. Finding lists are available through the Bancroft Library's website.

³⁰ Where Harrington's notes are quoted here, they are referenced by microfilm series, reel and frame; e.g., Harrington (3:102:582) is reel 102, frame 582 of microfilm series 3 (Southern California). Harrington's Gabrielino work was carried out in 1914-1917, and again in 1933.

³¹ Hale gives another Gabrielino form for 'canoe, boat' as well, <nikín>, not recorded elsewhere. I believe it is the result of an elicitation error. In Gabrielino, the independent possessive 1SG pronoun, 'mine', is given as <ne-hin'> by Merriam (1903a). It appears that what Hale actually elicited was not 'boat', but 'my things'. A similar

/ta'rainxa/ (without specifying vowel lengths) is the most straightforward underlying form consistent with all three elicitations, where /x/ is realized as [x] or [χ]. I read Hale's <traínχe> as [ˈtrain.χə], with reduced vowels in the final and initial unstressed syllables.³² I emphasize that the nasal is /n/, not /ŋ/; this point is important in the later analysis. For Hale's exemplar, this is straightforward, as he consistently uses the symbol <ŋ> for the velar nasal, e.g., <atónjin> 'mouth', cf. Kroeber (1907:74) *ni-toñin*.³³ In comparing Hale's wordlist to others, it appears that <ŋ> and <n> are always transcribed correctly.

Taylor's <Ta-rin-ha> is also consistent with /ta'rainxa/, within the limits of variation in his orthography. Taylor's orthographic <i> usually corresponds to [i], and [q] and [x] are usually represented by <k>. However, Taylor's form for 'blood' is <a-hin>, representing [ʔa-χain] 'his blood'.³⁴ In other words, Taylor's <h> may stand for [χ] and <i> may stand for [ai] (as in English). With these orthographic variants, Taylor's <Ta-rin-ha> fits with the phonetic form *tarainxa* suggested here. Again, the nasal is not [ŋ], which Taylor consistently transcribes <ng>.

In Merriam's <Tah-rī'ng-hah>, <ɪ> represents [ai], as it does elsewhere, following common English dictionary phonetic spelling. The first <h> in <hah> could represent [h] or [χ]. <ng> appears to be a nasal velar, in contrast to Hale and Taylor. I read the phonetic form as [ta'rainχa] or [ta'rainqχa], underlyingly /ta'rainxa/ with *n* assimilating to *ŋ* under the influence of a following χ. The affrication of [q] to [qχ] also occurs in Serrano (Hill 1967:4). Merriam's informant, Narcisa Rosemyre, had a Serrano father and a Gabrielino mother, and she spoke both languages (McCawley 1996:17); the pronunciation here might be influenced by her Serrano.³⁵

I emphasize again that the *ŋ* or *ŋ* does not represent an underlying back consonant. If the phonetic form recorded by Merriam had been [taraiŋa], he would have recorded it as something like <Tah-rī'ng-ah>, as in his <Ah-soo'ng-ah> 'inside', cognate with Luiseño *-sun-ŋa* 'inside', literally {heart-LOC} (Elliott 1999).

Merriam lists another Gabrielino form, <Hoo-pā'-kah tar-rī'n-hah> 'A kind of pointed instrument' (Merriam 1903a [McCawley 1996:245]). I will discuss this form and its semantics below, but for now I will only mention that I believe <tar-rī'n-hah> in this compound is the very same word as <Tah-rī'ng-hah> 'tule boat', the differences reflecting either phonetic variation or Merriam's inconsistent transcription.

Klar and Jones claim a different form of the word, *taraina*, <tarayna> in their orthography (A:474; B:388, 390, 396n10; C:766; D:89; E:175). They base it on a comment by Pamela Munro, but mention no primary sources or any other justification for it. They mention the form *tarainxa* only in B (p. 396, n. 10), basing it on a comment by Jane and Kenneth Hill, and again quoting no primary sources. Evidently, Harrington also considered *taraina* a possibility, as he

misunderstanding appears in Hale's Luiseño ('Netēla') grammatical notes (Hale 1846:567). There he has <tçomīχ> 'our boat', <om omīχ> 'thy boat', etc. But these are clearly the Luiseño *ča'mix* 'our property' and *ʔom ʔo'mix* 'you, your property' (Elliott 1999). I suspect Gabrielino <nikin> is the result of a similar misunderstanding, maybe even through the same informant. A similar interpretation of <nikin> was suggested to me by Pamela Munro (p.c. 2009).

³² "The χ is, in those tongues, a somewhat deeper guttural than the Spanish *jota*." (Hale 1846:535)

³³ Orthographically <ni-toñin>. In Kroeber's notation <ñ> is the velar nasal *ŋ*: "ñ, nasal of k as n is to t" (Kroeber 1907:90). The stems here are preceded by the possessive prefixes *ʔa-*, 3SG, or *ni-*, 1SG.

³⁴ Kroeber (1907:76) <mu-xain> 'their blood' (in the Fernandeano dialect); Hale (1846) <aχain>; Gatschet (1879) <akhain>. In Gatschet's vocabularies, <kh> is "a surd guttural aspirate, the German *ch*..."; <ai> is "as in *aisle* ('long *i*' in *pine*)" (Gatschet 1879:423).

³⁵ Compare also the affrication in Cupeño *dara:ngxa* 'orange', from Spanish *naranja* (Hill 2005:180).

attempted to elicit both *taraina* and *tarainxa* from three separate informants while reeliciting Hale's and Taylor's wordlists.³⁶ My guess is that he considered the possibility that the <h> in Taylor's <Ta-rin-ha> was a record of non-phonemic aspiration, although there's no other evidence for such aspiration in the language. In any event, *taraina* is inconsistent with Hale's and Merriam's forms, while *tarainxa* is consistent with all three, as I have shown.

Klar and Jones refer to *taraina/tarainxa* as the Gabrielino "word for 'boat' in general". This is inaccurate. Both Hale and Taylor give an imprecise gloss for the word, without specifying the type of boat in question, but they did not attempt to elicit the words for different types of boats, and their informants may have been familiar with only one type. On the other hand, Merriam's Gabrielino wordlist was based on a questionnaire tailored for work with California Indian languages. There are separate entries in Merriam's questionnaire form for 'Boat (log dugout)', 'Canoe', 'Kayak or bidarka', and 'Boat (bundles of tules)'. In the Gabrielino vocabulary the first three entries are left blank, but <Tah-rī'ng-hah> is recorded for 'Boat (bundles of tules)'. This suggests that the word refers specifically to tule boats, and not to boats in general.

I have no details on Hale's informant. Taylor's informant, Juan de Parma, was born and raised near the San Gabriel mission, some 30 km from the coast. Merriam's informant, Narcisa (Mrs. James) Rosemyre, grew up there as well (McCawley 1996:17). It may be that the inland Gabrielino were the first to lose the collective memory of the ocean-going plank canoe, while still remembering the more widespread tule boat.

8.3 The Gabrielino Record: *tiʔa:t*

The presumed Gabrielino word for 'planked canoe' is recorded only once in Harrington's notes, and apparently nowhere else. Its source is the informant José María Zalvidea:

ti'át lancha, cayuco. Z[alvidea]. *ti'át*, canoe. Z. It was so called because it carried many people. 'at, people. Made with boards, calked with mineral tar, and tied together with string made of horsetail, he volunteers. [Harrington 1986, 3:102:582]

In two later attempts to elicit the word, Harrington's informants were not familiar with the form.³⁷ Both times Harrington spells the word as <te'áat>; Either *te'ʔa:t* or *ti'ʔa:t* is an acceptable reading, since Gabrielino neutralizes the *i:e* contrast in unstressed positions. Both informants were familiar with tule boats. I agree with Klar and Jones (B:388-389) that Zalvidea's

³⁶ Harrington apparently had no access to Merriam's vocabulary.

³⁷ "N[escit] **te'áat** but ev[idently] sic. Inf[ormant] heard that the island indians came over here to mainland in the tule fixed some way" (Harrington 1986, 3:103:515). "N[escit] G[abrielino] ***te'aát**, canoe. Inf[ormant] supposes they are of tule, for he heard that tejian [they wove] these boats of tule. Pl[ural] **tetfi'aatam**" (Harrington 1986, 3:103:87). For the plural form, Harrington notes that the first *a* is indeed long and the second is indeed [a], not [o], confirmed by repeated elicitation. Klar and Jones (B:389) quote Pamela Munro as saying this plural, *te'ti:ʔa:tam*, is anomalous, *te'ti:ʔatam* with a short *a* being the expected form (and see Munro 1983:291-297), and Harrington obviously found the plural form odd as well. But since the informant did not know the singular form *te'ʔa:t*, he must have produced what was to him the regular plural inflected form, perhaps an idiosyncrasy of that informant's speech.

Harrington's Serrano informant, on a visit to San Pedro, produced *'tfaʔatf* as the word for 'boat', as well as 'basket' (Harrington 1986, 3:101:416). This Serrano word is recorded elsewhere with the meaning 'basket' alone. This might be an interpretation of the Gabrielino *ti'ʔa:t* by folk etymology.

explanation is unsatisfactory. As they point out, Zalvidea's <'at> (/ʔat/) is obscure, and the usual Gabriellino word for 'person, people' is *taxa-t*. *ʔa:t* might have occurred to Zalvidea based on its phonetic similarity to the Luiseño *ʔata:x*, 'person, people'. His explanation does not address the first part of *ti'ʔa:t*, and appears to be a folk etymology.

I see no reason to doubt Zalvidea about *ti'ʔa:t* meaning specifically a plank canoe, as opposed to a tule boat or a boat in general. Zalvidea's father was from Santa Catalina Island, some other ancestors of his were coastal as well (McCawley 1996:17-18), and so he was more likely to know about ocean-going boats than Harrington's and other linguists' informants, who were from near the San Gabriel mission, tens of kilometers away from the coast.

8.4 The Chumash Record: *tomol(o)*

By and large, I agree with Klar and Jones's reconstruction of the Proto Southern Chumash **tomolo* (B:372-373, 379-381) based on the attested forms in the Chumashan languages. The word is attested in various sources and dialects as *to'molo*, *'tmolo*, *'tomol* and *'tomolʔ*; some of the variation is between dialects, and some different forms appear among speakers of the same dialect. *tomolʔ* appears to be a variant of *tomol*, following a general process of devoicing of /l/ word-finally and elsewhere (Klar 1977:21-22). *tmolo* appears in Ineseño and Isleño Chumash, a variant of *to'molo* with a reduced unstressed syllable. The *m* is glottalized in some Barbareño elicitation. The earliest record of Barbareño *'tomol*, 'lancha o canoa', is from the Portolá expedition of 1769 (Costansó 1770:40); it appears in various later wordlists and throughout the notes of John P. Harrington.

Based on the forms *tomolo* and *tomol*, Klar and Jones reconstruct the protoform **tomolo*, with *tomol* the result of final vowel deletion. That is the reconstruction also given by Klar (1977:76). Arguably, one could reconstruct the protoform as **tomol*, with an echo vowel appearing in some dialects and then further phonologized.

Klar and Jones (B:380-381) further attempt to use internal reconstruction to derive the protoform **tomolo* from an earlier **tomoloʔ* (phonetically [*tomoloʔo*]), which would better fit their proposed Polynesian source. As far as I can tell, the additional syllable is adduced to explain the glottalization of the Barbareño variant *toʔmol* and the Ventureño plural *tomtomoʔol*, and which is explained as a result of regressive assimilation to the *ʔ* of the following syllable, since lost. While this scenario is possible, it is not clear to me whether the glottal might not be explained through other routes, which do not require the longer older form. In any event, any of the proposed earlier forms **tomol*, **tomolo* or **tomoloʔ* agrees with my discussion of the word below.³⁸

9 The Proposed Polynesian Etymologies

In the following sections, I will discuss the Polynesian etymologies suggested by Klar and Jones for the California words for boat, *tarainxa*, *tiʔa:t* and *tomol(o)*. The California words would have to match those Polynesian words spoken at the inferred time of contact. As discussed above, the

³⁸ *Tomol* is commonest form of the word in the archaeological and ethnographic literature (Hudson et al. 1978, Gamble 2002, Bernard 2004, etc.) *Tomolo* is used by Klar, by Jones, and by Heizer (Heizer 1941a, Heizer and Massey 1953). I generally use *tomol* in this paper as a matter of convention, not as a statement on what I think is the underlying form or the protoform.

Polynesian language spoken then would have been something like reconstructed Proto East Polynesian. I find that none of the three proposed Polynesian etymons match the meanings Klar and Jones would assign to them. Moreover, for *tarainxa* and *tomol(o)*, the phonological shapes of the Polynesian words fail to match those of the Californian words. In other words, the Polynesian words did not sound as Klar and Jones claim they did, did not have the right meaning, and so cannot be the sources of the proposed borrowings.

9.1 Gabrielino *tarainxa* as Polynesian

The case for Gabrielino *taraina* or *tarainxa* as a Polynesian loan is first brought up in A (pp. 475-476) and elaborated in B (pp. 390-394, 396). According to Klar and Jones, the stem to be analyzed is *taraina* (B:396). They explain the form *tarainxa*, suggested to them by Jane and Kenneth Hill, as the Polynesian *taraina*, with a Gabrielino “adjectival suffix” *-xa*, which is given no further explanation or justification.

Leaving *-xa* for the moment, I next examine Klar and Jones’s claimed etymology, Gabrielino *taraina* ‘boat’ < Polynesian ***taraina* ‘carved object’ < PPN **tarai* ‘hew, carve’ + ***na* ‘nominalizer’, which they compare to the attested Hawaiian *kalaina* ‘carving’ < *ka:lai* + *-na* (Pukui and Elbert 1986; Elbert and Pukui 1979:81).³⁹

The Hawaiian nominalizer *-na* is a regular reflex of Proto Polynesian **-ŋa* (Biggs and Clark 1993, Krupa 1982:52). Phonologically regular reflexes of **-ŋa* are attested in all the major languages of East Polynesia and in many outside it.⁴⁰ As noted above, **ŋ* changed to *n* only in Hawaiian, South Marquesan, one Maori dialect, two neighboring Austral dialects, and nowhere else in Polynesia. According to Elbert (1982), the South Marquesan and Hawaiian **ŋ > n* shift may have a common origin, in which case the shift occurred independently at most three times; very likely one or more of the occurrences of **ŋ > n* are due to some old language contact. In any case, it occurred in the two Marquesic languages, Hawaiian and S. Marquesan, after the differentiation first of Marquesic and then of the Marquesan dialects, in Bay of Plenty Maori after the differentiation of Tahitic and after the settlement of New Zealand, and in Tubuai and Rimatara after the differentiation of the Austral languages. There is thus no evidence of **-ŋa > **na* anywhere in East Polynesia at the time the plank canoe first appeared in California. An East Polynesian word for ‘carving’, cognate with the Hawaiian *kalaina*, would have been at that time **taraiŋa*, not **taraina*, and would have been borrowed into pre-Gabrielino as **taraiŋa*.

If the word had been borrowed into Gabrielino as *taraiŋa*, it would not have changed since then to *taraina*. The distinction between *n* and *ŋ* in Gabrielino goes back at least to Proto Tactic, as the following examples show:⁴¹

³⁹ I use **** to mark forms which I believe did not exist, in reconstructed or putative languages.

⁴⁰ In Nuku Hiva Marquesan the nominalizing suffix *-ka* < **-ŋa* is no longer productive, but still appears with a small, closed set of verb stems (Zewen 1987:100).

⁴¹ The *n/ŋ* distinction goes even farther back, to Proto Northern Uto-Aztecan, and possibly to Proto Uto-Aztecan (Campbell 1997:136-137; Dakin 2001). See Kroeber (1907) for examples from elsewhere in Northern Uto-Aztecan.

Gabrielino *-ŋa* ‘locative’ (Munro 2000, ex. 8, 38, 68); Luiseño *-ŋa* ‘in’, ‘on’, ‘among’, etc. (Elliott 1999).⁴²
Gabrielino *ni-* ‘1SG possessive’ (Merriam 1903a); Luiseño *ni-* (Elliott 1999); Kitanemuk *ni-* (Anderton 1988).
Gabrielino *noŋ-in-* ‘tongue’ (Hale 1846; Taylor 1860c; Merriam 1903a; Kroeber 1907); Cupeño *naŋ-* (Hill 2005); Kitanemuk *nŋi-* (Kroeber 1907; Anderton 1988).
Gabrielino *sun-* ‘heart’ (Kroeber 1907); Proto Cupan *su:ni-* (Munro 1990); Serrano *hu:n-* (Ramón and Elliott 2000:563; **s* is often reflected as *h* in Serrano and Kitanemuk.)

In other words, *n* and *ŋ* have existed side by side in Gabrielino and its ancestors from well before the advent of sewn plank boats and up to the historical period.⁴³ If a Polynesian word **taraiŋa* were borrowed into an earlier stage of Gabrielino, it would still appear in the historically attested form as ***taraiŋa*, not *taraina* or *tarainxa*, contrary to what is recorded. On phonological grounds, then, the Polynesian derivation fails.

As mentioned before, Klar and Jones don’t explain the *-xa* at the end of the form *tarainxa*, beyond mentioning that *-xa* appears as a Gabrielino adjectival suffix, and suggesting the decomposition *taraina-xa*. The ending *-xa* indeed appears in a few Gabrielino adjectives: *kwahoxa* ‘red’ (Kroeber 1909:251), *jumaxa* ‘black’ (Fernandeño; Kroeber 1907), *hupaxa* ‘sharp’ (Merriam 1903a), and some others. But of the ca. 75 adjectives in Merriam (1903a), only about 10 end with <kah>, <chah> or <hah>. *-xa* is thus by no means an obligatory or common marker of adjectives. More essentially, there is no explanation why an adjectival suffix would be added to a borrowed noun to create another noun. If anything, one would expect that a noun borrowed into Gabrielino would take an absolutive suffix, resulting in something like ***taraiŋa-t*, just as Klar and Jones propose for forming Gabrielino *ti?a:-t* from Polynesian **tia*. Their explanation,

Either form — with or without a Uto-Aztecan suffix — could be borrowed from a Polynesian language, with **taraynxa* being more fully nativized in Gabrielino than is *tarayna*. [B:396]

does not hold. There is no morphological path by which to go from Polynesian ***taraina* (even if that form had existed) to Gabrielino *tarainxa*.

On semantic grounds there are difficulties as well. The reflexes of the PEP nominalizer **-ŋa* have two functions, in which they resemble the English *-ing*. Most commonly they produce pure nouns associated semantically with the parent verb stem. For example, Hawaiian *kalaina* ‘carving’ < *ka:lai* ‘to carve, hew’. In some languages, they produce verbal nouns, similar to English gerunds, which share some syntactic properties of both nouns and verbs; for example Maori *moēŋa* ‘sleeping’ (and also ‘bed’) < *moe* ‘sleep’ (Krupa 1982:50). Klar and Jones are not clear as to which sense their presumed Polynesian word **tarai-na* would have. They refer to a “hewn object” (D:89; E:175), but elsewhere to “the process of adzing or hewing — the quintessential technique in maritime construction” (A:476; B:390).

With the first use of **-ŋa*, ***taraina* would mean something like ‘a carved object’. A reflex of **taraiŋa* is recorded only in Hawaiian. It is not used anywhere to refer to boats, hulls or planks. For boat planks, the word usually used is *papa* (Kamakau 1869 and Kamakau 1976:118 for Hawaiian; Handy 1923:157 for Marquesan), from a stem of pan-Malayo-Polynesian distribution

⁴² The Gabrielino *-ŋa* locative suffix still appears in some present-day Southern California place names: Cahuenga, Topanga, Tujunga, Cucamonga. Many more are recorded in Harrington’s notes.

⁴³ By some estimates, Proto Takic started diverging around 1500 BC (Sutton 2009).

(Pawley and Pawley 1998:186), or else, in Hawaiian, the more generic *laʔau* ‘(piece of) wood’.

While *ka:lai* refers to boat-making in general in some Hawaiian compounds (e.g., *kahuna ka:lai waʔa* ‘boat-building master’, Fornander 1917(5):613), there is no indication of *ka:laina* ever being used to describe a boat or any of its parts. Moreover, this use only appears in Hawaiian, and is therefore a late innovation, well past the permitted time range of Polynesian-California contact. This Hawaiian innovation fits well with the historian Samuel Kamakau’s account, in which the Hawaiian settlers arrived in plank canoes but changed their predominant boat type to the more easily built dugout, taking advantage of the availability of the Hawaiian *koa* tree (Kamakau 1976:118).

If ***taraina* is to be a verbal noun, it would be referring to the manufacture of some part of a Polynesian canoe, such as the hull, strakes, or planks. However, as with English gerunds, it would only be used within longer sentences, and would not be easily borrowed into Gabrielino, especially in the scenario of brief and casual interaction Klar and Jones envision for the Polynesian-Chumash contact.

In sum, there seems to be no way by which Proto East Polynesian **taraiŋa* ‘carving’ — itself speculated and unsupported — could have become Gabrielino *tarainxa* ‘tule boat’. The phonological, morphological and semantic evidence all compel rejecting the proposed Polynesian source for this Gabrielino word.

9.2 Gabrielino *tiʔa:t* as Polynesian

Klar and Jones would have Gabrielino *tiʔa:t* derive from a Polynesian word, **tia* (A:474-475; B:388-390, 393, 394; C:766; D:89; E:175-176). As shown here, the PEP **tia* did exist, and is a good phonetic match to Gabrielino *tiʔa:t*, after the addition of the Gabrielino absolutive suffix. The semantics, however, argue against that borrowing scenario.

Throughout their papers, Klar and Jones suggest several Polynesian words — ‘to sew’, ‘mast’, ‘type of boat’, ‘small sticks used in boat construction’, ‘to pierce’ — all of the form **tia*, some cognate, but of different semantics and historical distribution:

...suggesting that the Gabrielino named their sewn-plank boat not after the source material (as did the Chumash) but after some feature of it (short pieces of wood or a mast (cf. the Hawaiian metaphorical extension ‘mast’), or a technique associated with building it (piercing the short pieces of wood to sew them together). [Klar and Jones B:389-390]

For any one of these etymons to be right, all the others have to be wrong. Casting a wide net for etymons in this way depends on semantic imprecision, and makes the argument less convincing than an argument based on a single more certain etymology. In any event, I examine here all of the proposed etymons.

9.2.1 *tia* ‘to sew’

The following are the documented senses of apparent reflexes of Proto East Polynesian **tia*, arranged by language and family, based initially on POLLEX (Biggs and Clark 1993) and supplemented using the standard dictionaries listed in section 7. Translations and slight rephrasings are mine:

The Plank Canoe of Southern California

EAST POLYNESIAN

Rapanui: *tia*. To sew (as a cape of tapa cloth).

CENTRAL EAST POLYNESIAN

MARQUESIC

Hawaiian: *kia*. Spike, nail; post; pillar; mast; (?) type of boat (in compounds).

Mangarevan: *tia*. To stick in, to drive a wooden piece into the ground, to drive in a nail.

Marquesan: (none)⁴⁴

TAHITIC

Tahitian: *tiatia*. Small posts.

Tuamotuan: *tia*. To stick in, as bunch of flowers; penis.

Maori: *tia*. Peg, stake; to stick in a peg or a thatching needle; to adorn by sticking feathers in.

Rarotongan: *tia*. Wedge, peg; to drive in peg or stake, to wedge in.⁴⁵

Tongareva: *tia*. Stake; wedge; stuff, filling (as small stones jammed between large ones).

According to POLLEX, the root **tia* ‘pole, stake’ is reconstructed as far back as Proto Malayo-Polynesian. Another sense, ‘to weave a net’ appears in the Tongic languages and in the outliers Tikopia, Takuu and Sikaiana, but not in any East Polynesian languages. The East Polynesian sense can be reconstructed as ‘peg’, ‘stake’, or any such object pushed into yielding matter; or as a verb signifying that action.

Klar and Jones most often associate **tia* with the sense ‘to sew’, referring to the lashing together of canoe planks. For this sense they rely on the sense of PPN **tia* reconstructed in POLLEX, ‘sew, stick in a peg or a needle, make a net’. But these three senses cannot all be reconstructed at every level of the Polynesian family tree. ‘Stake, peg’ and ‘to push in’ seem to be pervasive and stable throughout Polynesia. The specialized sense of ‘weaving a net’ appears in a number of Polynesian languages but nowhere in East Polynesia. The sense ‘to sew’, however, appears only in Rapanui, in what must be a local innovation in that language. Therefore, *pace* POLLEX, the sense ‘to sew’ cannot be reconstructed for Proto East Polynesian or Proto Central East Polynesian. In other words, **tia* ‘to sew’ did not exist in the language of the Polynesians who would have sailed the eastern Pacific when sewn plank boats appeared in California.

⁴⁴ Marquesan *tiʔa* ‘mast’ is unrelated: it is a regular reflex of Proto Polynesian **tila* ‘mast, boom’, going back to Proto Oceanic. The sound change *r > ʔ* occurs in Marquesan but in no other Polynesian language.

⁴⁵ POLLEX also lists Rarotongan *tia* ‘to close a sack by sewing’, quoting Savage (1962). Savage’s gloss actually reads “to bind or lash, such as in binding or lashing the lugs of the mouth of a sack filled with copra; after sewing up the mouth securely, the sewing twine is wound round the lugs on each side and the final fastening is done and a secure knot made to secure by binding or lashing and knotting”. This refers, then, not to the sewing but to the tying-up of the ends of the sack. The sense of tying or sewing does not appear in the later, comprehensive Rarotongan dictionary of Buse and Taringa (1995) or in any other Polynesian language, and is best left out of this cognate set.

Since Savage’s dictionary omits glottal stops, his <*tia*> could represent *tiʔa*, which would be the regular reflex of PCEP **tifa* ‘to close up, seal, patch, inlay’, cf. especially Tahitian *tifa* ‘to join things together; to dovetail’ (Davies 1851) and Marquesan *tifa* ‘to close, seal, plug, cover’ (Dordillon 1904). But neither *tia* nor *tiʔa* appear with that sense in any other Cook Islands dictionaries.

There are other reasons to reject **tia* ‘sew’ as a Polynesian word describing the lashing together of boat planks. Although much traditional Polynesian boat-making knowledge has been lost, there exist records of several verbs used to describe this action, which I will review here. None of them is a reflex of **tia*.

Some of the most extensive published native records of traditional Polynesian boat-building are from Hawaii.⁴⁶ I rely on the accounts of the nineteenth century native historians Samuel Kamakau and Davida Malo, of the ethnographer Abraham Fornander, and on one anonymous account, all published in Hawaiian and English.⁴⁷ I go in some detail here into the existing records of Hawaiian boat construction, not only to document the extent of the relevant Hawaiian vocabulary, but also to give some of the flavor of the various terms in context. The following are citations mentioning the lashing together of planked boats, and the lashing of strakes and end pieces onto dugout hulls.⁴⁸ Corresponding Hawaiian words and phrases and their English translations are marked in boldface:

- (1) A laila, **kāpili** ‘ia ka lā‘au, he ‘ahakea paha, he lā‘au ‘ē a‘e paha; e **kāpili** mua ‘ia nā mo‘o, a **holo** ‘ia i ka ‘aha a pa‘a ia; e **kāpili** ‘ia nā maka ihu a pa‘a ia mau wahi, e **kāpili** ‘ia nā kupe hope, a **holo** ‘ia a pa‘a i ka ‘aha; a laila, pau ke **kāpili** ‘ana o ka wa‘a. [Malo 1987:89]
 “After that were **attached** the carved pieces made of ahakea or some other wood. The rails, which were **attached** to the gunwales, were the first to be **fitted** and **sewed** fast with sinnet. The carved pieces at bow and stern were the next to be **fitted** and **sewed on**, and this work completed the **putting together** of the body of the canoe.” [Malo 1903:171]
- (2) *Kālai ihola nā kāhuna i ka wa‘a a oki, a **kāpili** ihola, a kau ka pu‘aki, pā‘ele a maika* ‘i... [Kamakau 1865]
 “The expert canoe builders hewed the canoe hulls, **attached** the parts, put on the rigging, and painted the canoe black” [Kamakau 1991:3]

⁴⁶ Traditional boat construction is also described in many early Maori texts. Much of the specialized Maori terminology is already available in complete quotations within the dictionary of Williams (1971). At the time of European contact, New Zealand Maori did not have fully planked canoes, though they had boats with washstrakes sewn on.

⁴⁷ There are other Hawaiian language sources, published and unpublished, on traditional canoe construction. I present here all the sources known to me for which both the Hawaiian texts and their English translations have been published. The nineteenth century Hawaiian newspapers quoted here can be accessed online through <http://nupepa.org> or <http://ulukau.org>.

⁴⁸ Longer texts in Hawaiian are given in standard orthography: <‘> is the glottal stop, and the macron indicates a long vowel. The published Hawaiian texts of Kamakau and Fornander do not indicate glottal stops or vowel length, and Anonymous (1939) uses them inconsistently; for those, the vowel macrons and glottal stops given here are mine. I am grateful to Puakea Nogelmeier for reviewing my transcriptions and translations and providing corrections. Some of the published translations have been rephrased.

- (3) Ua ‘ōlelo ‘ia mai nō ho‘i e ka po‘e i ‘ike maka i ia mau wa‘a, he mau **wa‘a ku‘i**,⁴⁹ a he mau wa‘a ‘āpana lā‘au i **humuhumu** ‘ia a pa‘a i ka ‘aha. Pēlā aku paha ka wa‘a o ka po‘e kahiko o Hawai‘i nei. [Kamakau 1867a]
 “People who have seen these canoes [war canoes of eighteenth century O‘ahu chief Pele-iō-hōlani] have told me that they were ‘**joined canoes**’, made of pieces of wood **sewn** securely with coconut husk cords. It would seem that this is the kind of canoe that ka po‘e kahiko [the people of old] had.” [Kamakau 1991:117-118]
- (4) Ua ‘ōlelo ‘ia, ‘o Kānea‘ia‘i mā, nā wa‘a kaua o Peleiōhōlani, he mau **wa‘a ku‘i**, a he mau wa‘a ‘**āpana** i hana akamai loa ‘ia. [Kamakau 1867b]
 “It was said that Kānea‘ia‘i and such, the war canoes of Peleiōhōlani, were **joined canoes**, boats **pieced** together and very skillfully crafted.” [translation mine; see Kamakau 1992:240]⁵⁰
- (5) ...he kālai ‘āpanapana, a nui ka ‘āpana, a laila **kāpilipili**, a lilo i wa‘a...
 ‘O kēia mau lā‘au, ‘o ia ka **papa** o ka wa‘a o ka po‘e kahiko i **kāpili** ‘ia i kahiko, i ke au o Wākea mā, a mamua aku a mahope mai, ‘o nā wa‘a o Wākea, ‘o Kumu‘eli ka inoa, ua **kāpilipili** ‘āpana ‘ia...
 ...‘o ka wa‘a o ka po‘e o Kahiki mā i holo mai ai i Hawai‘i nei, he wa‘a ‘**āpana kāpilipili** kō lākou... [Kamakau 1869]
 “The woods were shaped into pieces — many pieces — then **attached together**; this became a canoe.”
 “From these trees were made the **worked woods** that ka po‘e kahiko **fitted together** for canoes in the time of Wākea and before and after his time. Wākea’s double canoe, named Kumu‘eli, was of pieces of wood **fitted together** and so was kaloloamaile [kaloliamai], the double canoe of Kuha‘ilima. In the time of Laka mā [‘Laka and his people’] canoes were hewn out of koa — one large koa tree made one large canoe. This made the work less burdensome and wearisome, and shortened the labor. This was also true in the times of Hakalanileo, Niheu and Kana. But the canoes of the voyagers who sailed from Kahiki to Hawaii were made of **joined pieces**...” [Kamakau 1976:118-119]⁵¹
- (6) ...a laila, **houhou** nā puka o ka wa‘a, ‘o ka holo nō ia o ka ‘aha, no ka mea, ua pau i ke **kaulī** ‘ia mai ka uma o ka ihu a hiki i ka uma o ka lā‘au hope... [Kamakau 1869]
 “Then he **drilled** holes in the canoe for the sennit cords, and readied the **lashings** of the canoe from the curve of the bow to the back curve of the back end piece.” [Kamakau 1976:121]
- (7) A ma ka uma o nā lā‘au hope o ka wa‘a, a **pa‘a** ia i ka **holo** ‘aha ‘ia, a laila, **hahau** ka pola i waena konu o nā wa‘a... [Kamakau 1870]
 “After the clamping down of the rear pieces of the canoe and the **fastening** with **running** sennit-cord, the platform midway between the canoes was **lashed** on.” [Kamakau 1992:42]

⁴⁹ *ku‘i* is spelled <ku-i> in Kamakau’s published text, presumably being explicit about the presence of a glottal stop.

⁵⁰ It is not clear from the context whether the text refers only one boat, Kānea‘ia‘i, or many. The plural is sometimes used to refer to singular double-hulled boats.

⁵¹ Kahiki is not only Tahiti in the Societies, but distant lands in general, in this case Central East Polynesia: Kahiki place names earlier in the text include locations in the Societies and the Marquesas.

- (8) *‘O ka mea e pa‘a ai kēia mau lā‘au he kaula ‘aha.*
 “These pieces are **tied** on to the canoe [rims] with the sennit.” [Fornander 1917(5):612-613]⁵²
- (9) *‘O ka ho‘opa‘a ‘ana, me ke kaula ‘aha e humuhumu ai a pa‘a i ka wa‘a.*
 “In **fastening**, the sennit is used to **tie** these [braces] on to the canoe.” [Fornander 1917(5):636-637]
- (10) ...**Houhou** nō ho‘i ka puka ‘aha ma ia mau lā‘au mai mua a hope, ho‘okomo ka iwi lā‘ī. Pau kēia, **ho‘opilipili** mai mua a hope; kau **koa‘ekea**, **kaulī** mai mua a hope. Pau kēia, **ho‘okomokomo** ka ‘aha ma nā puka a pau mai mua a hope...
 “...Holes were also **bored** into those pieces of wood from front to back (and) ti leaf stems inserted. After this was done, they were **fitted** from prow to stern; **adjusted** and **perfectly fitted** from front to back. When this was done the sennit braid was **threaded** into all the holes from prow to stern...” [Anonymous 1939:158-159]
- (11) ...*A pa‘a ka wa‘a i ke kāpili ‘ia, ho‘okomo ka wae, ho‘a‘a a pa‘a.*
 “...When the **piecing** of the canoe parts was done, the thwarts were put in [and] **tied** firmly in place.” [Anonymous 1939:158-159]

The verb roots in these texts referring to sewing together of boat parts are (see also Pukui and Elbert 1986): *humu* ‘sew’, *kauli*: ‘lash’ (perhaps < *li*: ‘lace, as shoe’; also used as a noun), and *ku?i* ‘join; sew’; more specifically *holo* ‘thread through’, literally ‘run’ (cf. English ‘running stitch’); and more generally *pa?a* ‘join’ (also used adverbially, *a pa?a* ‘tightly’), *hoa* ‘tie, lash’, *ka:pili* and *ho?opilipili* ‘attach’, *koa?ekea* ‘adjust and fit parts to the canoe body’, and *ho?okomokomo* ‘insert’ (< *ho?o* ‘causative’ + *komo* ‘enter’, reduplicated for repeated action), referring to sennit cords pushed through plank holes.

Of the roots specifically referring to plank sewing, *humu* has cognates in Marquesan (Handy 1923:157) and some non-East Polynesian languages (< Proto Nuclear Polynesian **sumu* ‘tie, lash’). *li*: has cognates throughout Polynesia and beyond. The etymology of the Hawaiian verb *ku?i*, however, is unclear. It is glossed ‘join, stitch, sew, splice, unite’ (Pukui and Elbert 1986). Conceivably, it could be a reflex of Proto Polynesian **tui* ‘to thread pierced objects on a string; to sew’ (Biggs and Clark 1993), a very widespread root, reconstructed back to Proto Austronesian and with reflexes in nearly every Polynesian language.⁵³ **tui* is in fact reflected in Hawaiian as *kui*, ‘to string pierced objects; to thread as beads’. However, **tui* > *ku?i* would require an epenthetic glottal stop, an irregular and unusual change of form.

kia, the Hawaiian reflex of Klar and Jones’s **tia*, does not appear in these texts in any context, and as noted above, it is not documented elsewhere in Hawaiian with any sense resembling ‘to sew’.

Outside Hawaiian, I found one mention of a Tahitian verb referring to lacing canoe planks. In an account of the great canoe of the legendary Hiro, by tradition the inventor of the Tahitian plank canoe, the *pahī* (see also Handy 1932:46), there appears the Tahitian text of a song sung by the boat builders as they lashed together the boat planks, working on opposite sides and passing the cords to each other through the drilled holes:

⁵² Koakanu, Fornander’s source here, was a professional canoe builder.

⁵³ **tui* ‘thread pierced objects on a string’ is reflected in all the major East Polynesian languages. It also has the sense ‘to sew’ in all except Rapanui, Hawaiian and perhaps Tahitian (Handy 1932:5 has Tahitian *tui* ‘to sew on thatch [of house]’).

...E **tui** i roto, e puputa i vaho,
E **tui** i vaho, e puputa i roto.
Nati hua, **nati** mau...

“...**Thread** it from inside, it comes outside,
Thread it from outside, it goes inside.
Tie it fully, **tie** it fast...” [Henry 1928:550]

Here is a reflex of the ubiquitous Polynesian **tui* ‘sew, thread’. It is also used in this context in Maori, another Tahitic language: “*tui*, Lace, fasten by passing a cord through holes. Used of fitting a canoe, lashing the *rauawa* [washstrake], etc.” (Williams 1971).

Other verb roots referring to plank lashing and the like are Tongareva *hau* ‘lash together’ (Buck 1932:193) and Hawaiian *hau* ‘to lash’, from PPN **faʔu*, used in other contexts of boat building and fitting; Maori *aukaha* ‘lash the bulwark to the body of a canoe’ (Williams 1971), probably cognate with the Tongan *haukafa* ‘to lash (a boat or canoe) with sennit’ (Churchward 1959) and Samoan *sauʔafa* ‘to tie with sennit’ (Pratt 1893), ‘lash canoe plank to keel’ (Krämer 1994, 2:291 after Krämer 1902, 2:253);⁵⁴ Maori *mimira* ‘to fasten an end piece to the hull of a boat’ < *mira* ‘lash’ (Best 1925:73; Williams 1971); Manganian *ta:moumou* < *mou* ‘hold together’ (Mauriaiti et al. 2006, under *kiri*); Aitutaki (Cook Islands) *tu:taki* ‘join’ referring to boats built from two dugout bases joined end to end (Hiroa 1927:259); and Tuamotuan *faro*: ‘tighten the final lashing of a canoe’ (Stimson 1964) and Rarotongan *ʔaro*: ‘to lash or lace, as the sides of the canoe with sinnet’ (Savage 1964, as <aro>). The verb **fono* ‘to join pieces together’ has reflexes throughout Polynesia. It is used in the specific sense ‘to attach canoe planks’ in West Polynesia and the outliers, but not in East Polynesia (Biggs and Clark 1993). Some of these verbs also refer to the lashing of booms and other parts to the body of a boat.

To sum the Polynesian evidence regarding **tia* ‘to sew’: there is a respectable amount and variety of available materials in several East Polynesian languages describing the lashing on of canoe planks and end pieces. There exist several verbal roots of varying ubiquity referring to the sewing together of boat planks. **tia* is not used in any of these texts, nor does it refer to sewing in general anywhere except Rapanui. The only words meaning ‘to sew’ associated with plank canoe construction are the Tahitian verb *tui* and the Hawaiian *kuʔi* in the expression *waʔa kuʔi* ‘sewn boat’.

When a language (attested or reconstructed) is imperfectly known, guesswork is sometimes the only available option when trying to find the form of an unknown word, in this case ‘to lash together boat planks’. But here, a great deal of vocabulary specific to that meaning has already been recorded or reconstructed, and it is less likely that yet another common synonym has somehow slipped through undetected.

As shown, all East Polynesian verb roots reflecting **tia* have the primary sense of forcing a sharp implement into a material. The shift from ‘spike’ to ‘sew’ makes sense only for sewing with a needle, where the hole for the thread is created as the thread is pushed through it. That is not the case in the so-called sewing of planked boats, where a hole is first drilled, and a cord is then passed through through the existing hole, in what would be more accurately called in

⁵⁴ The Maori sound correspondences are irregular. Assuming a PPN form **saukafa* (Biggs and Clark 1993), from **sau* ‘?’ + **kafa* ‘sennit’, its regular reflexes would be Tongan *haukafa* and Samoan *sauʔafa*, as observed, but Maori shows *aukaha*, not the expected **haukafa* (orthographically < *haukawha >). *f>h* occurs sporadically and dialectally elsewhere in Maori (Marck 2000:43-44), and in fact **kafa* ‘sennit’ is reflected as Maori *kaha*, but the initial *s>∅* is irregular. Note that this putative **sau* is unrelated to the Tahitian, Hawaiian and Tongareva *hau* ‘to lash’ < PPN **faʔu*.

English ‘lacing’ or ‘lashing’; that meaning is accurately reflected in the root **tui* ‘to string through’, which also happens to serve as the commonest metaphor for sewing cloth and such in the Polynesian languages, and for plank lashing in a few. In other words, **tia* is unattested as the term for ‘sewing’ boat planks not by accident, but because its meaning is not the right one.

9.2.2 *titia/tiatia* ‘short sticks’

In their earlier papers (A, B) Klar and Jones suggested other possible meanings for **tia* to fit their hypothesis. Tahitian *titia* is glossed in one dictionary as ‘short sticks used for fastening together the pieces of a canoe when building it’ (Davies 1851);⁵⁵ that may be the *titi?a* ‘cross pieces in a canoe’ of Andrews and Andrews (1944), from *ti?a* ‘straight; across’ (<PEP **tika*). In other words, the reference is not to details of hull construction, but to the assembly of the boat, cf. *ti?ati?a* ‘uprights attaching float to outrigger’ (Handy 1932:39). The form *tiatia* ‘small posts’, is given in POLLEX, following one vocabulary (by Frank Stimson), with no further context.

It could also be that Davies’s *titia* parallels the recorded Tahitian *titi* ‘peg’, from *ti* ‘peg’ (Andrews and Andrews 1944), itself a shortened form of *tia*, discussed above. In the context of planked boat construction, *titi* is a short wooden peg which is forced into the hole in the planks of a sewn canoe, in order to hold the tension in the cord passing through it (Bataille-Benguigui et al. 2008:81); this technique is practiced in the Tuamotus, Tahiti and elsewhere in East Polynesia (see e.g., Haddon and Hornell 1936:89, 107, 142); the reduplicated form *titi* probably signifies a diminutive (e.g., Krupa 1982:49-50). As vague as the given gloss for *titia* is, it clearly does not refer to short planks sewn together, as Klar and Jones suggest it is (A:475).

Even supposing *titia* (recorded only from Tahitian) is related to *titi* ‘pegs for securing plank lashings’, it would make a poor candidate for borrowing with the meaning ‘boat’. These pegs are perhaps the smallest and least conspicuous parts of a sewn plank boat. To use them to refer a planked boat would be akin to using ‘spark plug’ or ‘lug nut’ to refer to a car. Moreover, such tightening pegs were never used in the plank boats of California. The Gabrielino would not have named their new boat after a part of the boat which they did not use.

9.2.3 *tia* ‘mast’

The Hawaiian *kia* ‘mast’ (**tia* in most pre-1800 dialects) reflects two unique semantic developments, ‘stake, post’ > ‘vertical pole’ > ‘mast’, neither of which is recorded from any other East Polynesian language. It is used in metonymic compound expressions referring to particular kinds of boats, e.g., *kia lua* ‘brig, two-masted schooner’ (lit. ‘two masts’), but never refers to ‘boat’ by itself. There are two problems with using this word as a source for the Gabrielino loan. First, the word is a Hawaiian innovation, and involved two semantic shifts, from pole (stuck in the ground) to pole (any tall stick-like object), and then to mast. Between Proto East Polynesian and *tia* ‘mast’ there are the splits of Proto Central East Polynesian, Proto Marquesic, and Hawaiian, and then these two semantic shifts. These five events must have been separated from each other by some time, and each stage removes the word further from the putative time of Polynesian-Gabrielino contact.

Secondly, the boats of Southern California never had masts, since they never had sails, as was discussed and emphasized by Jones and Klar (A:469; C:766). As with *titia* above, it is hard

⁵⁵ Davies (1851) does not mark vowel length or glottal stops. The dictionary of the Académie Tahitienne (1999) attempts to clarify the pronunciation for every item in Davies, but marks *titia* as having an unknown pronunciation.

to imagine why the Gabrielino would use for their new style of boat the name of an item which their boats did not have.

9.2.4 *tia*- ‘type of boat’

Another Hawaiian innovation is the bound morpheme *kia*- (**tia* in pre-nineteenth century Hawaiian) evidenced in the words for several types of boats (Pukui and Elbert 1986; Andrews and Parker 1922): *kialoa~kioloa*, ‘long, light and swift canoe’ (< *loa* ‘long’); *kiapoko* ‘short canoe with rounded hull, used for fishing near the shore’ (< *poko* ‘short’); *kiapoho* ‘a canoe with deep, curving hull’ (< *poho* ‘depression, hollow of a canoe [etc.]’); *kiapa*: ‘swift-sailing canoe’, and in nineteenth century Hawaiian ‘any vessel equipped with cross spars, bark’. Not much is known about these boats. Some additional details are available on the *kialoa*, described as a small, fast boat with low sides, seating one or two people, used for racing but especially in leading a fishing fleet (Holmes 1993:70, 123); such a small boat would have been a dugout, not a plank boat. Since even ‘a long *kia*’ is a small boat, it seems that *kia* is not a class of boat which includes large voyaging vessels and such. The morpheme *kia* might have come about by metonymy from the sense ‘mast’, or may have some other etymology.

Thus, Gabrielino *tiʔat* is not a loanword from a Polynesian root related to Hawaiian **tia*-, which describes a small dugout, entirely different from the type of boat which would have reached the Americas. And as above, this sense appears in Hawaiian only, a late development and past the appearance of the plank canoe in California.

9.2.5 *tia* ‘to pierce’

Finally, Klar and Jones mention a Mangarevan word, *tia* ‘to pierce, bore’, which they would like to relate to the drilling of holes in boat planks (A:475; B:389). In general, as I have shown above, **tia* refers to pushing through with a pointed instrument, not to drilling. The gloss ‘to pierce, bore’ is inaccurate. The only source for it, as mentioned by Klar and Jones, is Tregear’s Polynesian comparative dictionary (Tregear 1891). Tregear’s own dictionary of Mangarevan (Tregear 1899) has ‘to pierce, to stick in’, with no mention of boring or drilling. Tregear’s source for Mangarevan was a manuscript prepared decades before by French missionaries resident in Mangareva (Rensch 1991a:11).⁵⁶ I presume the French gloss in his source was *percer*, which can refer to either piercing with a sharp tool or to drilling, unlike the narrower Mangarevan sense of ‘piercing’ only. Tregear’s earlier English translation appears to have mistakenly reflected the broader semantics of a French gloss.

As with the words for plank sewing, there is direct evidence for a word referring to drilling holes in canoe planks. For Hawaiian, we have *houhou* (Kamakau 1869 and Anonymous 1939:158-159 quoted above). *hou* and its reduplicated form *houhou*, ‘to drill’, have cognates throughout the Polynesian Languages (Biggs and Clark 1993).

9.2.6 **tia*: Conclusion

Klar and Jones propose various Polynesian words, all reconstructed as **tia*, each with a separate semantic route toward being borrowed as Gabrielino *tiʔat*. Their most prominent one, ‘to sew’,

⁵⁶ Rensch (1991a) is a compilation of all published Mangarevan dictionaries and several manuscript vocabularies. It does not mention *percer* or any similar gloss for *tia*.

cannot be reconstructed to Proto East Polynesian and was certainly never used to refer to boat construction. The Mangarevan ‘to pierce’ suffers from the same flaws. The Hawaiian root for one particular boat type is a late innovation which does not refer to voyaging boats. The words for ‘short sticks’ (in Tahitian) and ‘mast’ (in Hawaiian) are late innovations which refer to features not used in Californian plank canoes. Their explanation,

...the Gabrielino named their sewn-plank boat not after the source material (as did the Chumash) but after some feature of it (short pieces of wood or a mast, cf. the Hawaiian metaphorical extension ‘mast’), or a technique associated with building it (piercing the short pieces of wood to sew them together). [B:390]

is a haphazard reach for a range of would-be etymons, each of which excludes the others, in the hope one of them would fit the desired result. As it turns out, none of them does.

9.3 Chumash *tomol(o)* as Polynesian

Klar and Jones claim that the reconstructed Chumashan *tomolo* can be explained as a loan from a Polynesian form, **tumura:ʔau*, meaning something like ‘useful wood’, and designating the material used in constructing sewn-plank canoes. I show here that this etymology fails on semantic and phonological grounds.

Klar and Jones’s proposed etymon **tumura:ʔau* is a reflex of Proto East Polynesian **tumu raʔakau*, a compound of PEP **tumu* and **raʔakau*. **tumu* is a stem reflected in many East Polynesian languages with the meanings ‘origin, source’ (in the abstract), ‘base, foundation’ (of concrete objects), ‘trunk (of tree)’, and in some languages ‘tree’, either as a stand-alone noun or in compounds denoting specific kinds of trees.

EAST POLYNESIAN

Rapanui: *tumu* tree trunk; origin, source of an idea.

CENTRAL EAST POLYNESIAN

MARQUESIC

Hawaiian: *kumu*. bottom, base, foundation; main stalk of a tree.

Mangarevan: *tumu*. tree trunk, stump; cause, origin, source.

Marquesan: *tumu*. tree trunk, stem; tree; bottom, base, foundation; the stumps of a beard [Crook et al. (1998)].

TAHITIC

Tahitian: *tumu*. base or trunk of a tree or plant (below the first leaves), stump, stem; root metaphorical); base, foundation, reason, cause [additional sources: Wahlroos (2002), Lemaître (1973)].

Tuamotuan: *tumu*. source, root, cause, origin; trunk, stump.

Maori: *tumu* foundation; stump, post.

Rarotongan: *tumu*. cause, reason; source (e.g., of a river), place of origin; foundation of a house, base of a mountain; tree stump, tree trunk, tap-root.

Tongareva: *tumu*. buttocks; base; cause, reason.

Reflexes of **raʔakau* occur throughout Polynesian, with the meanings ‘tree’ or ‘wood’. In some languages reflexes of **raʔakau* mean ‘piece of wood’, ‘stick’; in some they refer to specific

wooden implements.⁵⁷ In several East Polynesian languages the word means ‘medication’ or ‘medicine’, through metonymy akin to the English ‘herb’. ‘Wood’ or ‘tree’ are reasonable metonyms for ‘medicine’ in the context of Polynesian medicine; of the two dozen principal plant species of the traditional Tahitian pharmacopeia, about half are trees or woody shrubs (Petard 1972). Klar and Jones attempt to somehow use this secondary meaning to interpret the semantics of the protoform **tumu ra?akau*. However the two have clearly separate histories, and no such relationship is apparent.

EAST POLYNESIAN

Rapanui: *ra?akau*. castor bean; goods, property; medicine.⁵⁸

CENTRAL EAST POLYNESIAN

MARQUESIC

Hawaiian: *la:?au*. tree, plant, wood, timber, forest, stick, pole, rod, splinter, thicket, club; medicine; canoe end-piece (in compounds).

Mangarevan: *ra:kau*. wood; tree; medicine.

Marquesan: *?a:kau, ka:?au*. wood, tree, plant; type of club.

TAHITIC

Tahitian: *ra:?au*. plant, tree, wood, timber; medicine.

Tuamotuan: *ra:kau*. medicine; tree, plant; stick, twig, piece of wood in general; log; spear, weapon.

Maori: *ra:kau*. tree; wood, timber; stick, spar, mast; weapon.

Rarotongan: *ra:kau*. tree, bush, plant; timber, piece of wood, stick, pole, plank, board, bat, racquet; medicine.

Mangaia: *ra:kau*. tree, bush, plant; piece of wood, stick, wooden object; medicine.

Tongareva: *ra:kau*. stick, plank, timber, wood.

The compound of the reflexes of **tumu* and **ra?akau* appears in Tahitian, Rarotongan, and the Marquesic languages, meaning either ‘tree trunk’ or ‘tree’. In none of these languages has this compound undergone any other semantic extension. From its distribution, the form can be reconstructed to Proto Central East Polynesian.

EAST POLYNESIAN

Rapanui: —

CENTRAL EAST POLYNESIAN

MARQUESIC

Hawaiian: *kumula:?au*. tree.

Mangarevan: *tumu ra:kau*. tree trunk.

Marquesan: *tumu ?a:kau, tumu ka:?au* (with metathesis). tree.

TAHITIC

⁵⁷ In Hawaiian boat construction, the projecting bow and the stern pieces are sometimes made of separate pieces sewn on to a dugout base, and respectively called *la:?au ihu* ‘bow wood’ and *la:?au hope* ‘stern wood’. I have not seen either of those called just *la:?au*.

⁵⁸ The meaning ‘medicine’ is attested in the first substantial Rapanui dictionary (Roussel 1908; Churchill 1912), but not in later wordlists. Modern Rapanui uses *ra?akau* only in the sense of ‘castor bean’ (Fuentes 1960; Arredondo 1988; Blixen 1972). The Tahitian form *ra:?au* appears in loanwords (Arredondo 1988).

Tahitian: *tumu ra:ʔau*. tree.

Tuamotuan: —

Maori: —

Rarotongan, Mangaia: *tumu ra:kau*. tree; trunk, log.

Tongareva: —

Reflexes of **tumu raʔakau* never mean ‘wood’, only ‘tree trunk’ and hence ‘tree’. It appears that the compound is used specifically to avoid the ambiguity between ‘wood’ and ‘tree’, and in some languages it has largely replaced the reflex of **raʔakau* as the word for ‘tree’. That argues that the word never meant ‘wood’, as Klar and Jones would have it, even if it was present in Proto East Polynesian.

Klar and Jones are not precise in describing the semantic path from Polynesian **tumu raʔakau* to Chumashan **tomolo*. By their original proposal (A:474, 476; B:384), a reflex of **tumu raʔakau* meant ‘wood’, ‘source of wood’, or ‘economically useful tree’ in the Polynesian donor language, and was borrowed into Chumash with the sense of ‘tree for making boat planks’, while at the same time expanding its Chumashan meaning through metonymy to signify ‘planked boat’; elsewhere, they suggest the Polynesian word for ‘wood’ was misunderstood by the Chumash to have meant ‘boat’ (A:476). In later papers (B:397; D:89; E:175), they advocate a more complex scenario within Chumash from ‘wood’ to ‘planked boat’. In all these variations, the Polynesian **tumu raʔakau* is taken to have meant ‘wood’ or ‘wood source’.

But as shown here, no reflex of **tumu raʔakau* ever meant ‘wood’. Nor would the Chumash borrow a word for ‘wood’, to them a familiar and much-utilized material, for which the word has been reconstructed back to Proto-Chumashan **ponoʔ*, and is reflected in all its daughter languages (Klar 1977:115-116).

Semantically, the closest one can come to rescuing Polynesian **tumu raʔakau* as a source for Chumashan *tomolo* is by positing that the Polynesian word ‘tree’ was borrowed into Chumashan with the sense ‘yellow pine’, a tree favored for boat construction, which then became the word for plank boat (this semantic path has not been suggested by Klar and Jones.) The metonymic extension from ‘yellow pine’ to ‘boat’, which I discuss at length below, is certain. However, the Chumash would not have been likely to borrow a Polynesian word to replace the name of a tree long familiar to them, after a very brief and superficial encounter.

Phonologically, Jones and Klar’s suggested Polynesian source for the borrowing, **tumu ra:ʔau*, does not fit what is known of Polynesian historical phonology. To get from PPN **tumu raʔakau* to **tumu ra:ʔau*, two shifts are required, namely **ʔ>∅* followed by **k>ʔ*, as discussed in section 7. The change **ʔ>∅* can be reconstructed as having affected PCE, since no Central East Polynesian language has preserved PEP **ʔ*. But the change **k>ʔ* occurred separately and later in several Central East Polynesian languages and cannot be reconstructed to any older subgroup.

As I have shown above, the Chumash *tomol* came to exist, at the latest, just as people were entering East Polynesia, and therefore speaking Proto East Polynesian (not PCEP, as Klar and Jones suggest at times). The split of PEP into Rapanui and PCEP would have yet to occur, the PCE shift to **ʔ>∅* would be later still, and the shift from **k* to *ʔ* would occur in some daughter languages even later. Even if some unattested dialect of PEP existed in which **ʔ* had already been lost, the subsequent **k>ʔ* shift would still be unexplained. Klar and Jones refer to this phonological mismatch (B:384) and propose, ad hoc, such an unattested Polynesian dialect. But to acknowledge the earlier sound change, they propose that this would be a dialect of PCEP, which would have to be considerably later than the date of contact.

Put another way, if Polynesians had reached the California coast at the end of the first millennium AD, the only time at which the chronologies of both the earliest *tomol* and the settlement of East Polynesia might overlap, their phonetic form of the word in question, if they had it, would then be **tumu ra?akau*. I won't attempt to predict the exact form this word would evolve to in the Chumashan languages by AD 1800, but it is certain that the *k* would persist, since Proto Chumashan **k* is reflected as *k* in all Southern Chumashan languages (Klar 1977:11-13, 29). Since the word *tomol(o)* and its reconstructed protoforms contain no *k*, it cannot have come by that route.

To summarize, *tomol(o)* is not a Polynesian loan. There is no evidence that a reflex of the Polynesian protoform which Klar and Jones propose existed when the *tomol* was invented. If it did, it did not sound as they claim it did, did not mean what they claim it did, and would not have been borrowed as they suggest.⁵⁹

9.4 Discussion: The Linguistic Case for Polynesian Contact

Klar and Jones's linguistic argument for Polynesian-Chumash contact is not supported. The three Polynesian sources proposed would be reconstructed as **taraiŋa* 'carving', **tia* 'spike' and related meanings, and **tumu ra?akau* 'tree trunk' in the Polynesian language spoken at the time of the proposed Californian contact. None of them are semantically plausible as sources for a term for boat in a borrowing language, as detailed above, and none of them are reflected in boat-building terminology anywhere in East Polynesia. Two of the words, **taraiŋa* and **tumu ra?akau*, are also excluded for phonological reasons as the sources of the Gabrielino *tarainxa* 'tule boat' and Chumash *tomol* ~ *tomolo* 'plank boat', and neither of the two can be securely reconstructed to proto East Polynesian

While each of these claimed etymologies fails to stand on each its own, the combination of all three is even less plausible. This combination would require a scenario in which a brief encounter between the Polynesian visitors and the indigenous Americans would result in no less than three different borrowed terms, one into Chumash and two separate ones into Gabrielino, with each requiring a separate set of implausible semantic and phonological changes. As Anderson (2006:759) points out, the Chumash would be more likely to have borrowed directly a reflex of the near-universal Proto Polynesian **waka*, 'boat'.⁶⁰

On closer look, the case for Polynesian-Chumash contact turns out to have no foundation in archaeology, linguistics or boat technology. While it remains possible that prehistoric Polynesians reached North America, there remains no evidence to prefer placing this contact in Southern California over any other location between the Aleutian Islands and Colombia. Any

⁵⁹ Terry Hunt (quoted in Lawler 2010:1347) proposes that *tomol(o)* might have been a late borrowing into Chumashan, through one of the many Polynesians recruited as sailors aboard European ships in the late 18th and early 19th centuries. Aside from the same semantic objections which apply to an old borrowing, *tomol* 'boat' was recorded in 1769 (as mentioned above), only two years after the first European contact with Tahiti and a decade before Cook reached Hawaii, and long before any East Polynesian sailors were so recruited.

⁶⁰ Klar and Jones (A:476; B:392-393; D:766) argue that the Chumash would not have borrowed the generic word for 'boat', as they doubtlessly already had terms for boats in general and for specific types of boats. However, American English has borrowed from Mexican Spanish the generic terms *sombrero* 'hat' and *salsa* 'sauce' to refer to more specific meanings associated with Mexican culture. The Chumash could likewise have borrowed a generic Polynesian term to refer to a Polynesian type of boat.

such contact remains in the realm of pure speculation.

10 Local Etymologies

I have shown above that the proposed Polynesian etymologies do not hold, which reopens the question of the linguistic history of the Gabrielino and Chumashan words under discussion. In the etymological study of any language, one encounters words resistant to historical analysis. This is true even for languages such as English, with its wealth of documentation, historical materials from the language itself and from related languages, and centuries of intensive study. Certainly many opaque etymologies will be expected for a poorly documented language such as Gabrielino, or in members of an isolated language family such as Chumashan. Therefore, the lack of an internal etymology for a Chumashan word does not strengthen the case for an external origin, as Klar and Jones (A:473, B:381) argue for *tomol(o)*. As it turns out, I will show here that all three words in question — Gabrielino *tarainxa* and *ti?at*, and Chumashan *tomol(o)* — have discernible linguistic histories, which do not involve borrowings from other languages.

10.1 A Local Etymology for *tarainxa*

Besides the early wordlists, nearly all the extant data on the Gabrielino language comes from the field notes of John Peabody Harrington, who worked with some of the last speakers of the language and collected a great deal of phonetically precise and linguistically sophisticated lexical and grammatical data. Harrington made an effort to re-elicite the earlier wordlists of Hale and Taylor. After several failed attempts to reelicite Hale's or Taylor's forms for 'boat' from his informants (Harrington 1986, 3:103:632, 747), one informant (perhaps Jesús Jauro) produced the following:

- g. [Gabrielino] **taráaynxa'** está horqueteado, tiene horqueta,
 e.g., está horqueteado el palo, tiene horqueta el palo.
 [is forked, has a fork, e.g., the stick is forked, the stick has a fork]
 g. **taráayn'exáa**, abre las piernas, spread your legs.
 Tr[anslate]s. una horqueta: **pokúu' taráaynxa'**,
 e.g., the palo de sauco horqueteado [forked stick of elder] used by game players.
 N[escit] "**tarayna**"
 [Harrington 1986, 3:103:112. Comments in brackets are mine. Gabrielino forms are bolded for clarity]

There seem to be two forms here, the adjectival *ta'ra:jnxa'* 'forked' and the imperative verb *ta'ra:jn'exa:* 'be forked (imperative)'. Both forms are based on a stem *ta'ra:* 'fork'. In the neighboring Tadic language Kitanemuk there exists a nominal root *tara-* 'fork' (Anderton 1988:516), as in *tara-hu't*, 'cradleboard', lit. 'forked willow', and *tara-ka'j* 'cloven (said of deer's hoof)', 'forked pole'. In the closely related Serrano, the word for 'forked stick' is *tara'qa'*, also meaning 'cross' (Ramón and Elliott 2000:58, 59, 149, 553). In Kitanemuk, the derivational suffix *-ka'j* produces from a nominal stem X another nominal or adjectival stem meaning 'characterized by X' (Anderton 1988:143), in this case 'fork' > 'forked, forked object'. The Serrano example appears to exactly parallel the Kitanemuk one. Possibly the Luiseño placename *taráxa*, originally referring to Saddleback Mountain (Elliott 1999), is related. I thus tentatively parse the Gabrielino form *ta'ra:jnxa'* as *ta'ra:i-n-xa'*, {fork-?-?-CHARACTERISTIC}, with the stem and final suffix corresponding exactly to the Kitanemuk forms. The medial morpheme or

morphemes are obscure to me at present.

Merriam's Gabrielino wordlist also includes the following pairs:

<O-hā't> 'sand'	:	<O-hā'ting-ah> 'sandy'
<Kwe-nar'> 'mud'	:	<Kwe-nahng-ah> 'muddy'
<To-tah'> 'rock'	:	<To-to'-ting-ah> 'rocky' [Merriam 1903a]

All three pairs show a pattern of deriving an adjective from a corresponding noun by adding a suffix, transcribed as <ngah> or <ingah>, to the stem. If these can be read as *-(i)-nxa/-ŋxa*, they would provide further examples of the adjectivizing morpheme in *tara:inxā*. In Merriam's orthography these morphemes would normally be read as *-ŋa/-iŋa*, but the locative suffix *-ŋa* does not easily fit here semantically, unless, perhaps, 'sandy', actually refers to 'a sandy place', etc. I cannot at this point easily choose one of these interpretations over the other.

As mentioned in section 8.2, Merriam (1903a) records the Gabrielino form <Hoo-pā'-kah (a point) tar-rī'n-hah> 'A kind of pointed instrument', following a list of other tools (but separate from the list of musical instruments), and across the page from the term for 'tule boat'. <Hoo-pā'-kah> is also glossed elsewhere as 'sharp' and as 'stone-pointed arrow'. I read this as *hu'pa:ka ta'ra:inxā*, lit. 'split point'. This might be a tool like a fork, or it might refer to a musical instrument, the split-stick clapper (Wallace 1978b:644). Harrington's *po'ku:ʔ ta'ra:inxāʔ* (*po'ku:ʔ* 'one', translating Spanish *una*) may refer to a game piece, or again to a clapper, as used for musical accompaniment during gambling games.

Harrington's verb *ta'ra:in?exa:*, the imperative 'be split', is distinct from *ta'ra:inxāʔ*; its final morpheme derives from *xa:* 'be, have'. It does not relate directly to the issues here.

Although the full parsing of the form is not fully clear, the meaning 'forked', is unambiguous. In Harrington's examples the word is used as a noun as well as an adjective, i.e., 'forked', 'forked thing', as with the Serrano and Kitanemuk cognates. It would be very unusual for such a long phonetic form, *ta'ra:inxāʔ*, to represent two unrelated homonyms, 'forked thing' and 'boat'. I propose here that the forms given by Hale, Taylor and Merriam for 'boat' are in fact the same word as Harrington's form for 'forked'. In the three-bundle and five-bundle tule canoes of Southern California and elsewhere, each side was formed of a long bundle of tule reeds tied together, with the bundles pushed apart over the keel bundle in the middle; the ends of two side bundles are tied to each other at either end of the boat, giving the appearance at each end of a single bundle forking into two thinner side bundles; hence *ta'ra:inxāʔ* 'forked thing' refers to a tule-bundle boat, as glossed by Merriam. When the early vocabularies were collected, the old plank boats and their name had been mostly forgotten, but Gabrielino people, even those living near the San Gabriel mission, far away from the coast, were still familiar with tule boats and some knew their name.

With a native etymology for this word, an explanation based on borrowing from another language is no longer necessary. Certainly the word cannot be considered 'anomalous', as Klar and Jones put it (A:475; B:390, 396; D:90; E:176), at least not in the usual sense of a odd phonotactics or opaque morphology, which often characterize borrowings.

10.2 A Local Etymology for *tiʔa:t*

Here I propose an etymology for the Gabrielino word for *tiʔa:t*, 'planked boat', though I consider it less certain than that of *tarainxa*. I propose that it comes from an otherwise unattested

Gabrielino verb stem, *tiʔa-* ‘to stack up’, and that the word literally means ‘stacked up thing’.

Luisseño has a verb stem, *ʔeʔa-* (intransitive form), glossed ‘be supported, be braced; get stuck; be stacked up’ (Elliott 1999), and ‘exert opposing force, parry a blow, prop up a structure’ (Bright 1968). It is used to refer to wood stacked up in a fire. The transitive form, *ʔeʔi-*, glossed ‘to support, brace’, also refers to a bird building its nest (Bright 1968); this verb underlies the noun *ʔe:ʔif* ‘bird’s nest’.

Hill and Nolasquez (1973) and Hill (2005:199) list the Cupeño place name *ʔaʃwət pəʔtiʔa* ‘Eagle’s nest, place where baby eagles were captured’, which they gloss *ʔaʃwət pə-ʔti-ʔa*, {eagle-NPN 3SG-roost-PSD}, and a corresponding item, *ʔtiʔa-* ‘to roost, of birds (class VI verb)’.⁶¹ I propose that Cupeño verb *ʔtiʔa-* is cognate with the Luisseño one, and means not ‘to roost’ (as in Hill) but ‘to build by stacking up’ (as in Luisseño). I reconstruct the Proto-Cupan form **ʔtiʔa-*, since Luisseño *e* often corresponds to Proto Cupan **i* (Bright and Hill 1967:115).

This sense, of a structure made of smaller things stacked and holding each other up, fits a boat whose sides are made of rows of attached small planks set atop each other like rows of bricks. I do note that a plank boat is different from pile of firewood or a bird’s nest, in that the pieces do not cross each other, and the structure is not held together by gravity alone.

Based on the limited records for the language, Gabrielino always lengthens the second vowel of CVCV verb stems. Other, similar lengthening processes occur in the language for other verb stem shapes and for non-verbal stems, under more complex conditions. Consider the following examples from Munro (2000), based on Harrington’s notes, with some Takic cognates (K. = Kitanemuk, Anderton 1988; L. = Luisseño, Elliott 1999):

<i>kwaʔa:</i>	‘eat’	K. <i>kwaʔ</i> , L. <i>qwaʔ</i>
<i>maxa:</i>	‘give’	K. <i>mak</i> , L. <i>maʔxani</i> (transitive)
<i>peʃa:</i>	‘leave’	
<i>moka:</i>	‘kill’	K. <i>mik</i> , L. <i>ʔmokna</i> ‘kill’
<i>jake:</i>	‘dance’	L. <i>ʔjaki</i> ‘[kind of dance]’
<i>čeʔe:</i>	‘sing’	
<i>jari:</i>	‘remain’	
<i>kovi:</i>	‘be hungry’	
<i>pako:</i>	‘enter’	
<i>hoho:</i>	‘fart’	K. <i>huhuʔ</i>
<i>koko:</i>	‘kill’	

And so, a Gabrielino cognate of Proto Cupan **ʔtiʔa-* ‘stack up’ would surface as *tiʔa-*. It remains to be shown that a nominal form can be constructed from this verb stem by adding the absolutive suffix *-t*, with the derived noun taking on the sense of the patient or object of the verb.

The most common way of deriving an unpossessed patient noun from a verb stem in the Takic languages is by adding the absolutive suffix *-if~-ič~-iṯ*; for example, Luisseño *ʔe:ʔ-if* ‘bird’s nest’ mentioned above, Kitanemuk *mak-iṯ* ‘gift’ < *mak* ‘give’ (Anderton 1988), or Gabrielino *kwaʔ-ič* ‘food’ < *kwaʔa:* ‘eat’ (Merriam 1903a). However, there exists in some Takic

⁶¹ The gloss {eagle-NPN 3SG-roost-PSD} is following Hill (2005:199). NPN is a non-possessed noun suffix, the so-called Uto-Aztecan absolutive suffix. PSD is a suffix marking a noun as possessed. An alternate analysis would be *ʔaʃwət pə-ʔtiʔa*, with *ʔtiʔa* a stem which does not take a possessive suffix (Hill 2005:170-171).

languages a more marginal derivational pattern involves adding the absolutive suffix *-t*. In Kitanemuk, what Anderton (1988:150, 692-697) calls the ‘general nominal’ is formed by suffixing *-at~ats̄* to an unpossessed verb stem, e.g., *mayha*[?] ‘give birth’ > *mayha-t* ‘child’; *punita*[?] ‘play game’ > *punita-t* ‘game’. In Cupeño (Hill 2005:298-299), an unpossessed noun can be formed from a transitive verb stem by adding the absolutive suffix *-t~ət*; this derived noun may have the sense of a patient of the verb.

The Cupeño and Kitanemuk evidence makes it plausible that the *-t* nominalizer existed throughout Takic, including Gabrielino. The Cupeño semantics do not exactly match those expected for Gabrielino *tiʔa:t-t*, but the semantics of nominalization in Gabrielino may differ.⁶² There may be enough material in the notes of Merriam and Harrington to clarify this issue in future work. At present, the possibility remains that Gabrielino *tiʔa:t* has the etymology ‘stacked-up thing’, from an otherwise unrecorded root but with recorded cognates in Luiseño and Cupeño. In any case, as with *taʔa:inxaxa*[?] above, the word cannot be considered ‘odd’ as Klar and Jones suggest (B:389), at least in the sense of morphological shape or phonotactics.⁶³

10.3 A Local Etymology for *tomol(o)*

As Klar and Jones themselves have mentioned (A:476; B:376-378, 392, 397), in some Chumashan languages the word for ‘planked boat’ is formally identical to that meaning ‘yellow pine’.⁶⁴ This has been noted in print at least as early as Kroeber (1910:268 n.3), and later by Heizer (1941a:60-61), Heizer and Massey (1953:298), and Hudson et al. (1978:23). Klar and Jones (B:376-378) present in detail the recorded Chumash forms. In their interpretation, *tomol* ‘plank boat’ is a later semantic development from *tomol* ‘yellow pine’ (for which they apparently advocate a Polynesian origin), with the sense of ‘wood suitable for plank boat making’. They contrast *tomol* ‘yellow pine’ with Chumash terms for other types of pines.

I argue here that *tomol* ‘yellow pine’ is an old Chumash word, of unknown etymology, and is the source for the term for plank boat, as was already suggested by Heizer (1941a), Hudson et al. (1978: 22-23) and perhaps others.

The following sources attest the Chumashan *ʔtomol* ‘pine’.⁶⁵ The list is not exhaustive, and

⁶² Hill sees an aspectual distinction between the Cupeño *-its̄* nominalizer and the *-ət* nominalizer, following the earlier analysis of Jacobs (1975:71). In Hill’s analysis, the *-ət* deverbal nouns refer to the objects of verbs describing actions in the immediate past, or ones still relevant within the current discourse context. This does not seem to apply in the Kitanemuk examples, nor, I speculate, in Gabrielino.

⁶³ Klar and Jones’s comment about *tiʔa:t* being ‘odd’ is attributed to a personal communication with Pamela Munro. They never clarify whether that refers in fact to any aspect of the word itself. Elsewhere (A:475, B:390) they quote Munro as saying that “*tiʔat* is somewhat odd in having no stress or length marked”, which refers to the transcription, not the word itself. This comment of Munro’s may be based on the secondary source (Hudson et al. 1978) used by Klar and Jones, which quotes Harrington but omits his stress and length marks.

⁶⁴ In western U.S. English, the term ‘yellow pine’ encompasses ponderosa Pine (*Pinus ponderosa*) and Jeffrey Pine (*Pinus jeffreyi*), two species of closely similar appearance, lumber quality and geographic distribution within California.

⁶⁵ Klar and Jones (B:376) mention Kroeber (1910) as a source for *tomol* ‘pine’; Kroeber’s sources are Taylor and Gatschet, as given here. They also mention Harrington as another source for Island Chumash *tmolo* ‘pine’. Harrington only recorded *tmolo* ‘boat’ when reeliciting Taylor’s wordlist. His informant, Fernando Librado, speculates that “since make cayucos [canoes] out of pine, might call the latter also **tmolo**” [Harrington 1986,

more instances probably exist in Harrington's notes:

<i>'tomol</i>	'pino'	Purisimeño [<Tómol>, Arroyo de la Cuesta 1837:8].
<i>tomol</i>	'pine-tree'	Barbareño or Cruzeño. The informant was born on Santa Cruz island ca. 1781 but was baptized and lived at the Santa Barbara mission [<tomol>, Taylor 1860b]. ⁶⁶
<i>'tomol'</i>	'Pine'	Barbareño (Kaswa, near the mission) [<to'-molgh>, Gatschet 1879:444]. ⁶⁷
<i>tomol̥</i>	'pine'	Barbareño. "The kind of pine we see on top of the ridge here are called tomol — that is what the people called it." [<tomol̥>, Luisa Ignacio, informant; Harrington 1986, 3:20:283, recorded 1913-14].
<i>tomto'mol</i>	'pines'	Barbareño [Juan de Jesús Justo, informant; Blackburn 1975:209].

The form given by Juan de Jesús Justo displays a glottalized *m*, as do some of the Barbareño variants for the homonym signifying 'boat'. This further reinforces the identity of the two forms, especially in light of Klar and Jones's reconstruction of the earlier form, based on the presence of this glottalization, discussed in section 8.4.

The identification of *tomol* specifically as 'yellow pine' comes from Harrington, who distinguishes it from *tak*, a class of trees including all other pines of the area (Hudson et al. 1978:48 n. 3), and less suitable for plank boats. This seems reasonable, but remains to be verified.

Of the sources here, Arroyo de la Cuesta's form is in Purisimeño, which was spoken well outside the range of yellow pines, but the word could have been borrowed from the neighboring Barbareño or Ineseño. Taylor's informant gives the forms for both 'pine', <tomol>, and 'canoe, boat', <tomolo>. The different forms in this doublet might be due to free phonological variation, but more likely, the informant used the Cruzeño form for 'boat', but had borrowed a Barbareño term for 'yellow pine', since no pines grow in the Channel Islands except a stunted form of the Torrey Pine (*Pinus torreyana*), now restricted to parts of Santa Rosa Island (Griffin and Critchfield 1972). Luisa Ignacio's comment, if recorded near Santa Barbara, would refer to the top of the Santa Ynez mountains, which are too low to support yellow pines; perhaps her identification was inaccurate.

It appears that *tomol* can only be demonstrated to mean 'pine' in Barbareño. Although terms for various types of pines have been recorded from Ventureño and Ineseño speakers (Klar and

3:68:31] and "since cayucos made of pine, might perhaps call a pine tree **t'molo**" [ibid., 3:68:196]. These appear to be ad hoc etymologies, fashioned in response to Harrington's inquiry. Jones and Klar (2012:221) read this as saying that "the primary meaning of *tomol* was not pine," but Librado is clearly non-committal, and would not have known the early history of the word.

⁶⁶ Taylor gives the informant's name as Joseph Camuluyaset. In mission records he appears as José Crespín Camuluyatset, born in Liam [Santa Cruz Island], and baptized in Santa Barbara in 1819 at age 38 (Huntington Library Early California Population Project, <http://www.huntington.org/Information/ECPPmain.htm>).

⁶⁷ In Gatschet's orthography <gh> is 'a sonant guttural aspirate (Arabic *ghain*)' [1879:423]. Oscar Loew, the collector, probably heard *tomol'* or perhaps *tomol̥*; compare his <ulgh> 'foot' to *?i'* (Whistler 1980).

Jones, B:376), I know of no record of *tomol* as a term for pine in these languages, nor any other term specifically for ‘yellow pine’. Whether a cognate existed in Ventureño or Ineseño is unknown.

Drift logs of redwood were the preferred material for canoe planks, but *tomol*, or yellow pine, was considered a workable material as well (Hudson et al. 1978: 46-50). Could *tomol* pine have taken its name from the word for the plank canoe?

In English, for example, there are many artifacts named for the material from which they were manufactured: ‘glass’, ‘wood’, ‘box’, ‘broom’, ‘iron’, ‘silver’, ‘cloth’, ‘clothes’, ‘marble’, ‘horn’, and many others. On the other hand, I know of no clear examples of materials named after items made of them. A simple explanation is that in general a material is known, and thus has a name, long before any particular use is made of it: glass (the material) was known and named before glass (the vessel), and so on.⁶⁸

In the specific case of trees and woods named after artifacts, a search in a large English dictionary for ‘-boat’ and ‘-wood’ compounds yields only ‘bowwood’, ‘buttonwood’, ‘greasewood’, ‘coachwood’, ‘lancewood’, ‘leatherwood’ and ‘bottle tree’. These are all species exotic to England, and became known to English speakers together with the use to which they were put. In no case was an older name for a native tree replaced with the name of an artifact or a compound based on an artifact.

In the languages of California, I know of three examples of trees named for their use as sources of boat lumber; all are from far northern California. In Karuk, the word for ‘redwood’ is *?uθkanpahip*, lit. ‘oceanward canoe tree’ (*?u:θ-kan-pa:h-?i:p* {ocean-LOC-canoe-tree}, Bright 1957). In nearby Chimariko, the word for ‘redwood’ is *mutumana*, ‘canoe plant’ (*mutuma-na* {canoe-PLANT}, Dixon 1910:314). These examples parallel the English ones: redwood trees do not grow in Karuk or Chimariko territories, and dugout canoes, when used by these peoples, were obtained from the Yurok who lived in the redwood belt to the west (Davis 1961). As in the English examples, the words are compounds, not straight metonyms, and refer to an exotic wood known primarily for one use. In Klamath, the suffix *-?m* is used to derive *wondʒʒʒm* ‘fir species used for canoe making’ from *wondʒʒʒ* ‘canoe’. Here the species is not exotic to Klamath territory, but the word relies on a derivational process which is productive in Klamath (cf. *?amda* ‘digging stick’, *?amdalam* ‘mountain mahogany’), but very rare elsewhere.

Yellow pines were undoubtedly familiar to the Chumash since well before the advent of the plank canoe. Yellow pines grow at high elevations in the mountains north of Santa Barbara and Ventura, within Chumash territory. Their range overlaps much of that of the piñon pine (*Pinus monophylla*), whose seeds, i.e., pine nuts, were a significant food source of the Chumash and other California Indians (Grant 1978:516; Timbrook 2007:142-146; Barrows 1900:63); pine pitch, too, was collected in the mountains on pine-nut collecting trips (Hudson et al. 1978:52). Yellow pines must have had a Chumash name before plank canoes came to be, and this name would not have been replaced by the word for ‘plank canoe’, especially as pine was secondary to salvaged redwood in plank canoe construction (Hudson et al. 1978:46-50). This parallels the earlier argument against the replacement of the word for ‘yellow pine’ by a Polynesian borrowing.

Klar and Jones attempt to bolster their case for a Polynesian source of the word *tomol(o)* by

⁶⁸ In Chumashan languages one finds the sets *poʔn* ‘tree’, ‘wood’ and ‘board’, ‘plank’, ‘stick’ (Whistler 1980); *pox* ‘agave’ and ‘agave fiber cord’ (Hudson & Blackburn 1982:90); *?axpiʔlil* ‘nerve, sinew, muscle’ and ‘bowstring’ (Whistler 1980). I believe that here as well the materials preceded the objects.

arguing that the word (or its suggested protoform **tomolo*²) is unusual in being so long without being a transparent compound (B:381, 385). I will not attempt to offer an etymology of *tomol(o)* ‘pine’, but a counterexample is Barbareño *toq’olo* ‘armpit’, with the same phonotactic shape as *tomolo* or its variant *to²molo*. *toq’olo* is morphologically opaque, and as a term for a body part is not likely to have been borrowed from another language. Perhaps *toq’olo* or *tomolo* ‘pine’ will some day find full etymological explanations.

10.4 Pine Trees and Wooden Boats in Southern California

Chumash is not the only language in the area where words for ‘pine’ and ‘boat’ are formally identical. Pine/boat homonymy exists in Luiseño, some 200 km south of Chumash territory, and in Kitanemuk, adjacent to Chumash territory in the interior. These two Takic languages are the only languages known to me, in California or elsewhere, in which ‘boat’ and ‘pine’ (or any wood for that matter) are homonyms.⁶⁹ The rarity of this semantic equation and the close proximity of the languages which exhibit it imply a historical connection.

The following are the lexical items under discussion:

Luiseño	<i>wi'xe-t</i> ”	‘tree sp. (pine?)’ ‘tule boat’
Luiseño	<i>'pawxi-t</i> ”	‘yellow pine’ ‘wooden boat’
Serrano	<i>wiakt</i>	‘sugar pine’
Kitanemuk	<i>kwi'akt</i>	‘tule boat’
Proto Cupan	<i>*weket ~ *wexet</i>	‘pine sp.’
Kitanemuk	<i>kwekt</i>	‘tule boat’

I derive all of the above, ultimately, from Proto Uto-Aztecan **wokon-*, ‘pine’ or ‘ponderosa pine’ (Fowler 1983:248), and relate the parallel meanings to the Chumashan ones, through contact.⁷⁰

10.4.1 Takic Terms for ‘pine’

The following lists all the Takic reflexes of Proto Uto-Aztecan **wokon-* ‘pine’, which vary

⁶⁹ I have done a cursory survey of words for ‘boat’ or ‘canoe’ in standard dictionaries of several California languages. Often the word is a short morpheme with no obvious etymology (Klamath, Shasta, Yurok, Karuk, Achomawi, Yokuts [several varieties]). In a few languages the word has a clear morphology based on a verbal stem: Wiyot, lit. ‘it comes’; Hupa, ‘they travel in it’; Wintu, ‘travels by water’; Maidu, ‘bridge which floats things’; Salinan, ‘travels by water’ (Harrington 1986, 2:84:233); Mesa Grande Diegueño, ‘that which floats’. In a number of others the word recorded is a Spanish or English loan word (Yuki, Nisenan, N. Sierra Miwok, S. Sierra Miwok, Plains Miwok, Tümpisa Shoshone, Chemehuevi), though other words may turn up in older materials. The Gabrielino etymologies suggested in this paper, ‘forked thing’ and ‘stacked-up thing’, are in a class of their own, and so are the Chumash, Luiseño and Kitanemuk ones based on ‘pine’.

⁷⁰ Manaster Ramer (1993) reconstructs PUA **wokon-* ‘pine’; earlier authors reconstruct **woko-*.

formally and semantically within the family. These almost never refer to the piñon pines (*P. monophylla*, *P. edulis*), PNUA **tiba-* (Fowler 1983:237), which form an unambiguously separate lexical category in the NUA languages.⁷¹

Direct reflexes of Proto Takic **woko-*:

- Cahuilla *'wexet-t* 'pine' (desert dialect), 'ponderosa pine' (mountain dialect)
- Luiŕeño *wi'xe-t* 'tree sp.', *we'xe²-ta* 'pine sp.'
- Gabrielino *'wexa-t* 'pine' (a loanword?)
- Kitanemuk *wokoh-t* 'gray pine (*P. sabiniana*)'
- Serrano *'wo'xo^h-t* (?) 'pine sp.'⁷²

A reflex of Proto Takic **woko-*, of unclear provenance, and its loans:

- Serrano *wiakə-t~'wiak-t~wix-t* 'sugar pine, Coulter pine (*P. coulteri*)'
- Cupeño *wiçakə-t* 'piñon pine'
- Gabrielino *wi'fa:xa-r ~ wef'ja:xa-r* 'pine'
- Kawaiisu (Numic, not Takic) *wiyahaka-ti-bi* 'sugar pine'

Loans within Takic:

- Gabrielino *woxo-t* 'gray pine' < Kitanemuk **wokoh-t* 'gray pine'

Luiŕeño compounds based on *wi'xe-t*:

- Luiŕeño *'pa-wxi-t* 'yellow pine'

⁷¹ The following are the sources for this list; the forms are transcribed into standard orthography, except where they are phonetically imprecise: Desert Cahuilla — *wexet* 'pine', Seiler and Hioki (1979); <Wē^{ch}-ah-tut' > 'ponderosa pine' (Merriam 1907a); Mountain Cahuilla — <Wē^{ch}-ēt' >, <Wē^{ch}-ēt' > 'ponderosa pine' (Merriam 1910); Cupeño — *wə'xiti-t* 'pine', Hill (2005:472), Hill and Nolasquez (1973); <We'-chuk'-ket po-wel'-lah' > '[the base of] piñon pine', Merriam (1933), analyzed as in Hill (2005:191); Luiŕeño — *pawxit* and *wi'xe²tut*, Elliott (1999); *wixet* and *pawxit* are identified as unspecified kinds of tree in Hyde and Elliott (1994:90); *wi'xenivifla*, Bright (1968); *we'xemevefla* (Soboba dialect), Harrington (3:103:650); Gabrielino — <wach-o't' > 'gray pine', Merriam (1903b); <ushi-a'gar' > (Gatschet 1879), <wish-ye-arker' > (Taylor 1860a), *wef'ja:xa-r* (Harrington 1986, 3:103:650), *wi'fa:xa-r* (Harrington 1986, 3:102:626); <wéxat' > 'pine' (Galloway 1978, probably after Harrington); Kitanemuk — Anderton (1988), specifically *'wokoht* (after Harrington) or *wə'kəht* (after Zigmond) 'gray pine'; <Waw'-kot' > 'gray pine' (Merriam 1903d); Serrano — <Wi'-yahkt' > 'sugar pine', <We'-aht' >, <We'-hah'-kut' > 'Coulter pine', Merriam (1907b,c); <wəxə't' > 'Has edible seeds. a smaller pine sp., lots at Big Bear' (Harrington 1986, 3:101:23); Munro (1977:312) quotes Donald Crook as saying Serrano stress tends to fall on initial and long vowels, but is generally lexically determined; but Ramón and Elliott (2000:xxxiv) state that Serrano has no word-level stress. Kawaiisu — *wiyahaka-ti-bi* 'sugar pine', Zigmond (1981:50); Proto Cupan — Bright and Hill **we'xet* (1967:183); the justification for the form **we'ket* is given here in the text.

The word *we'xe²ta* 'another kind [of pine]' appears in Harrington (1986, 3:103:650), among several Luiŕeño ('Reyano') words, which themselves appear within the Gabrielino notes. From the context *we'xe²ta* appears to be Luiŕeño, not Gabrielino. In addition, the glottalization and the absolutive *-ta* are characteristic of Luiŕeño, and the stressed syllable *xe* is not long, as would be typical for Gabrielino.

⁷² Harrington's <wəxə't' > is irregular either in the language or in its transcription. Harrington usually uses <ə> to mark the sound [ɛ] (Anderton 1991) but a root **wixi-* or such cannot be related to the protoform **woko-* by any known Takic sound changes. On the other hand *wo'xo^hht* would be a straightforward cognate for Kitanemuk *wokoht*, the recorded regular reflex, but that would have Harrington transcribing Serrano *o'* as <ə> instead of his customary <or' >.

Luišeño *wi'xe-nivifla*, *we'xe-mevefla* 'pine sp.'
 Derived form of Proto Cupan **we'ke-~*we'xe-*:
 Cahuilla *'wexatu-t* 'ponderosa pine' (desert dialect)
 Luišeño *wi'xe'tu-t* 'sugar pine, Coulter pine'
 Cupeño *wə'xiti-t* 'pine'

Some of these etymologies need further comment. Cahuilla *'wexe-t*, a regular reflex of the Proto Takic, is semantically broad, and possibly reflects an earlier situation in the Takic languages, where the mountain flora were not yet familiar in detail; this may be the situation in Luišeño as well, though details on the semantics of Luišeño *wixe-t* are lacking. In Serrano, the word was specialized to refer to sugar pines, and to the similar Coulter pines; and in Luišeño, this root was used to form a new stem to refer to the yellow pines.

Forms deriving from **wiakət* and its loans appear in Serrano, Gabrielino, Cupeño and Kawaiisu. The Gabrielino and Cupeño forms show strengthening of the glide *ia*, to *ʃ* and *ç* respectively. Serrano shows variable syncope of the last vowel, which regularly occurs following a stressed syllable (Hill 1967:261). In Gabrielino, the *-t* absolute has changed to *-r*, as occasionally occurs elsewhere (Kroeber 1909:269). The spirantization of the velar in Serrano indicates that it is a back *k*, since *k* does not spirantize (Hill 1967:256).

The root *wiakə-* is not a regular reflex of PUA **wokon-* in any of the Takic languages or reconstructed protolanguages. I tentatively assume that it ultimately derives from that proto-root. A possible path would be through a Cupan **wike-*, borrowed into Serrano or Proto Serran, and undergoing an irregular change **i > ia*, as for example Serrano *'po'niava-t* 'skunk' (Fowler 1983:237) corresponding to Kitanemuk *poniva-č* 'id.' (Anderton 1988) and PNUA **poni-* 'id.' (Fowler 1983:237). The Gabrielino and Kawaiisu forms could then be loans from Serrano. The shifts **i > *ia* and the strengthening of **ia* in the Cupeño form argue for a Gabrielino loan.⁷³

For Luišeño *'pawxi-t* 'yellow pine', Bright (1968) proposes the etymology *pa:wixe-t*, {water-pine}. Phonologically, this etymology is a good match, since it explains the initial stress of the compound as a consequence of the long vowel of *pa:*. While it is tempting to relate 'water' in the proposed compound to the Luišeño use of the tree as boat material (discussed below), I suggest a different etymology. *pa-* occurs sporadically in several Northern Uto-Aztec languages, as an augmentative morpheme:⁷⁴

Luišeño	<i>'naqwut</i> 'sumac, <i>Malosma laurina</i> '	<i>'pa:naqwut</i> 'sumac, <i>Rhus ovata</i> '
Luišeño	<i>'su:kat</i> 'deer'	<i>'pa:ʃukat</i> 'elk'
Cahuilla	<i>'pu:l</i> 'curing doctor'	<i>'pa'vu?ul</i> 'bear shaman' ⁷⁵
Kitanemuk	<i>haŋa?atʃ</i> 'bee'	<i>pahaŋa?atʃ</i> 'yellowjacket'
Kawaiisu	<i>tihija</i> 'deer'	<i>parihija</i> 'elk'
Tübatulabal	<i>?a:nint</i> 'yellow ant'	<i>pa:?a:nint</i> 'red ant'

⁷³ Merriam's Cupeño vocabulary, the source of *wičakə-t*, has other apparent Gabrielino loans.

⁷⁴ Sources for examples showing the *pa-* augmentative: Luišeño: Elliott (1999); Cahuilla: Seiler and Hioki (1979), Strong (1929); Kitanemuk: Anderton (1988), Merriam (1979); Kawaiisu: Zigmund et al. (1991); Tübatulabal: Voegelin (1958), Merriam (1979); Hopi: Hopi Dictionary Project (1998).

⁷⁵ Intervocalic *p > v*, as in **pu?ul > pa-vu?ul*, is common in Takic and elsewhere in Uto-Aztec.

Hopi *kunja* ‘fringed sagebrush,
Artemisia frigida’ *pa:kunja* ‘tarragon, *A. glauca*’

This list is not exhaustive, and several other examples exist in the languages listed and in others. However, there are not enough examples in any one language to judge whether this morpheme is productive in it, and so to judge whether words containing it have been borrowed from somewhere else. The *pa-* morpheme is likely cognate with Southern Paiute *paʔa* ‘high’ (Sapir 1931) and Kawaiisu *paʔa* ‘high, long, tall’ (Zigmond et al. 1991). In Luiseño, at least, the *a:* is long and attracts stress, just as *pa:-* ‘water’ does. The existence of the *pa-* augmentative has been briefly noted by Hill (2005:201) for Cupeño and Takic in general.

Some dictionaries of various Uto-Aztecan languages etymologize the *pa-* morpheme in various compounds as ‘water’ without any semantic justification, where the augmentative clearly makes sense. I suggest that in this case reading *pa-wxi-t* as ‘water pine’ is not well-supported, and that it is better interpreted as ‘big pine’, distinguished from smaller, economically unimportant pines.⁷⁶

Whatever the details of the etymologies for the various reflexes of Proto Takic **woko-*, that simple stem is the only one for ‘pine’ that can be reconstructed for Proto Takic, with various branches of the family innovating terms for specific pine varieties. This fits with a scenario where speakers of Proto Takic originated in an area with little diversity of economically useful pines. The speakers of the daughter languages would then have separately developed terms for the varieties of pine in the mountain terrains which they came to know or occupy.

10.4.2 Luiseño Boat Words: *pawxit* and *wixet*

The identity between the Luiseño forms for ‘wooden boat’ and ‘yellow pine’, *pa-wxi-t*, had been noticed before by Kroeber (1925:654). Kroeber (1910:268) had previously noted the ‘pine’=‘boat’ semantic equation in Chumash; but the connection between the Chumash and Luiseño examples was noted before only by Heizer and Massey (1953:298).⁷⁷ Jones and Klar, who refer to Heizer and Massey’s paper in other matters (A:460, 461) do not mention this point.

Luiseño *pa-wxi-t* ‘wooden boat’ is recorded by Sparkman (quoted in Elliott 1999), ‘a canoe formerly used by Luiseño fishermen’; DuBois (1908:131), ‘canoe (also a box carved out of a log to keep things in)’; Bright (1968), ‘dugout canoe’; and most extensively Harrington, in his notes to Boscana (1978:112-113). Harrington shows clearly that *pawxit* applies to wooden boats in general.⁷⁸ The earliest record of the word may be Crespi’s 1769 Juaneño form, <paut> ‘canoa o

⁷⁶ Serrano has the pair *ju'haʔs* ‘pine, ponderosa pine’ and *pa-juhaʔs* ‘bigcone spruce (*Pseudotsuga macrocarpa*)’ (Ramón and Elliott 2000:210; Merriam 1907b, 1909). In contrast to the Luiseño *pa-wxi-t*, here *pa-* probably does mean ‘water’, referring to the sap-rich heartwood of this tree.

⁷⁷ “This peculiar canoe-pine linguistic parallel can hardly be fortuitous, and leads one to suspect some specific connection between the Luiseño dugout and the Chumash plank canoe. This possibility is enhanced by the fact that for a long distance north of the Chumash and south of the Luiseño wooden canoes of any kind are unknown. How the development of these types occurred is impossible to say, nor is it easy to imagine what relationships the two boat forms have, since their occurrences are geographically exclusive and they are technologically distinct.” (Heizer and Massey 1953:298)

⁷⁸ Harrington (1986, 3:115:141) translates *pawxit* as ‘board boat’; and in his notes to Boscana (Boscana 1978:112-113) he has the Juaneño forms *pa-wxi-t ku'la:wtaʔ loʔxa-tʃ* ‘plank canoe’, lit. ‘canoe made of pieces of wood’, {wooden.boat-ABS wood.piece.INST make-NMLZ} (see Elliott 1999:408, 463); and *pa-wxi-t ha'ku-lʔi-tʃ*

balza' (Crespi 2001:306-307), though the elision of the *xi* is hard to explain.⁷⁹

The Luiseño *wi'xe-t* 'tule boat', formally identical to the tree word, is recorded as early as Hale (1846), as *wa'xe-t*, by Sparkman, "tule canoe formerly used by Luiseño fishermen" (Elliott 1999); by Harrington, "*wixét*, made of *pevéegaŋ*, round tule" (Harrington 1986, 3:115:141), also with the form *wi'xe:ʔet*, and by Bright (1968).⁸⁰ The data are summarized by Elliott (1999).

10.4.3 Kitanemuk *kwiakt* and *kwekt* 'boat'

Two forms in Kitanemuk are recorded for 'canoe': *kwi'akt*~*kwi'axt* and *kwekt*, used to describe the tule boats of the neighboring Yokuts of Buena Vista Lake (Anderton 1988).⁸¹ The forms resemble no Yokuts words, but do resemble the Serrano *wiakət*~*wiakt*~*wiact* 'sugar pine, Coulter pine' and the Proto Cupan **wexet* 'pine'. Kitanemuk territory bordered Chumash territory up to historical times, and there are Chumash loans in Kitanemuk. This would make a Kitanemuk 'boat'='pine' equation plausibly related to that in Chumash, if one could explain the Kitanemuk form.

To establish a connection between Serrano *wi'akt* and Kitanemuk *kwi'akt*, the shift of the initial consonant from *w* to *k^w* has to be explained. Both consonants are present in all Takic languages, normally as reflexes of the same consonants in the proto-language, e.g., in the reflexes of PUA **wokon-* 'pine', discussed above, and **kwa* 'eat'. However, at least one other example occurs in Kitanemuk showing *w > k^w*:

Kitanemuk *k^watskaveykə* : Serrano *watʃk^wubik*, *watʃkuvik* 'seven'
[Anderton (1988); Merriam (1907d); Hill (1967:27)]

Other than 'seven', the numerals 1-10 correspond nearly exactly between Kitanemuk and Serrano, e.g., Kitanemuk *watsa*, Serrano *watʃah*, 'four', from which the word for 'seven' is derived. A likely explanation for the initial consonant of Kitanemuk *k^watskaveykə* is that the *w* assimilated to *k^w* under the influence of the subsequent *k*.

With this, I posit *w > k^w* as a sporadic sound change in Kitanemuk, witnessed by the word for 'seven'. I suggest it operated on an older Kitanemuk form **wi'akt*, 'pine', either cognate with the identical Serrano form or borrowed from it. Thus at some point Kitanemuk **wi'akt* became *kwi'akt*, either before or after taking on the secondary meaning 'boat', following the semantics of the neighboring Chumash.

This scenario rests on the existence of a sporadic sound change, attested by only one other word, which adds uncertainty to the explanation. Further support to its existence comes indirectly from a well-established similar change in another language: in Italic, word-initial labial **p* may assimilate to labiovelar *k^w*, conditioned by *k* in the following syllable. This change is sporadic, and is witnessed in Latin by only three instances: *k^wink^we* 'five' < PIE

'dugout canoe', lit. 'hollowed canoe' {wooden.boat-ABS be.hollow-CAUS-NMLZ} (see Malécot 1963 for morphology). The mention of plank boats could refer to Chumash or Gabrielino boats, or it could have referred to European wooden boats, built of nailed planks.

⁷⁹ Compare Crespi's <piut> 'tobacco' to the later recorded form *'pivat* (Elliott 1999).

⁸⁰ Hale's list is in the Acjachemem (Juaneño) variety, which usually shows **i > a* in unstressed syllables (Lobo et al. 2005:45; Woodward 2007:90).

⁸¹ The second *k* of *kwi'akt* is marked as retracted by Harrington, with *k* and *k* possibly distinct in Kitanemuk, as in Serrano. Zigmond and Merriam, the other transcribers of the language, do not mark this distinction.

*penk^we; k^werk-us ‘oak’ < PIE *perk^w-o-; and kok^w- ‘to cook’ < PIE *pek^w- (de Vaan 2008). Such a change is therefore possible, though it may operate only sporadically. Two of these three Latin words happen to be a numeral and a tree, as in Kitanemuk.

As mentioned above, the identity of the velar consonant in the Serrano form *wiakt* is supported by its occasional spirantization to *x*, though that phonetic detail is not indicated by Merriam, the source for the form. The presence of the *k* in corresponding place in the Kitanemuk form further supports the historical connection between the two forms.

Anderton (1988:380) notes that *kwi'akt* is a likely borrowing, because of the final stress, which is atypical for Kitanemuk. It is not clear where the stress falls in the Serrano source proposed here, but stress on the *a*, which would fit with Anderton’s observation, is not excluded by the data.

The other Kitanemuk form, *kwekt*, follows similar reasoning. I start with a loan from a Cupan source, **weket*; the Cupan languages are the only ones which front Proto Takic **o* to *e* or *i*. Although all the Cupan languages show spirantization of *k* to *x*, this change may have occurred in Proto Cupan after the vowel change, which justifies this protoform. Next come **w* > *k^w* and lenition of the unstressed vowel, producing *kwekt*, exactly as with *wiaket* > *kwi'akt* above. The Cupan source is necessitated by the vowel change, but the location and sociolinguistic situation of this borrowing are unclear.

Serrano and Kitanemuk are closely related and geographically adjacent languages, and the Serrano word could plausibly be borrowed into Kitanemuk for a species of pine distinct from *wokoh-t* ‘gray pine’, the directly inherited word. Alternatively, the doublet **wokoh-t* / **wiak-t* could have existed in Proto Serrano and inherited by its daughter languages.

There is nothing to indicate at what stage of the formal development of this word it took on the secondary meaning ‘boat’.

10.4.4 Roseño Chumash *tak* ‘pine’, ‘dugout canoe’

Woodward (1934:121) quotes an earlier publication where a Santa Rosa Chumash of ca. 1820 described the use of dugouts and of plank canoes, and gave two words for ‘boat’, recorded as <toak> and <comow>.⁸² As discussed by Klar and Jones (B:378), these words resemble the Central Chumashan words for two types of pine, *tak* and *tomol*.⁸³ Klar and Jones are uneasy with the odd sound changes which the quoted Roseño forms show. I concur, though I believe that these apparent sound changes could be the result of copying errors. I think it is unlikely that <toak> represents *tok~toq*, the word for the milkweed cordage used for lashing boat planks.

If these forms are correct, then Roseño *tak* provides another example of a ‘pine’=‘boat’ semantic loan. If <comow> refers exclusively to a plank boat, then perhaps <toak>, by contrast, refers to the dugout canoe; both are described in the same source and in the same order.⁸⁴

10.4.5 The Areal Spread of ‘pine’ = ‘boat’

⁸² I have not seen the original form of this text, published in the *Santa Barbara Gazette*. Woodward accurately quotes a version published in the *San Francisco Herald* of Dec. 11, 1859.

⁸³ Barbareño and Ineseño *tak* ‘*Pinus sp.*’ (Timbrook 2007); Barbareño *taq* ‘white pine’ (Whistler 1980). Hudson et al. (1978:48 n.3) are not certain about the identity of *tak*, but believe it refers to all pines other than piñon pines and yellow pines.

⁸⁴ *tak* as an example of the boat/pine equivalence has been suggested before by Heizer (1941a).

The distribution of ‘pine’/‘boat’ words — clustered in Southern California and nonexistent elsewhere in the region — indicates a historical connection. As in the Chumash case, the original sense of Luiseño *wixet* and *pawxit* was ‘pine’ (going back to Proto Uto-Aztecan), with the sense ‘boat’ coming later. The appearance of this unusual semantic equation in Chumash and the geographically close but unrelated Luiseño can be explained as a semantic loan from one language to the other. Semantic borrowing (Durkin 2009:136; Hock 1986:398) is the process by which a language adopts a meaning for a word on the model of another language. As an example, the English *star*, originally referring to the celestial object, later came to take on the additional meaning ‘performing celebrity’; on that model, the Spanish *estrella* ‘star, celestial object’ took on the same secondary meaning, as did the equivalent words in Russian, Turkish, Hebrew and other languages.

In the scenario I suggest here, both the Luiseño and the coastal Chumash had dugout canoes constructed from pine logs; whichever of the two was the first to develop dugout canoes named the boat after its source material, yellow pine; and this type of boat construction and the semantics of its name passed together from one people to the other. At some later time, the Chumash developed the plank canoe, which mostly replaced the dugout but retained its name.

A similar scenario holds in Kitanemuk, where the dual meaning of *kwi'akt* ~ *kwekt* is explained as a semantic loan from the neighboring Chumash. No wooden boats existed in inland Southern California, and so the shift ‘pine’ > ‘wooden boat’ > ‘boat’ could not be explained by internal development alone. The semantics of the Kitanemuk word are comfortably explained as a result of contact with the dual meaning of *tomol(o)* in a Chumashan language.

As a working hypothesis, I will assume that the Chumash built wooden boats before the inhabitants of Luiseño country, and named them after pine trees. Chumash *tomol(o)* ‘yellow pine; wooden boat’ would then be the source of the semantic development of Luiseño *'pawxit* ‘ponderosa pine; wooden boat’ and *wi'xet* ‘pine, tule boat’. But it is possible, in principle, that wooden boats were first built in the south, where Luiseño is now spoken, and that the technology and the term were later taken up in the north, where the planked canoe was later elaborated. It is even possible that the ultimate source was some coastal Yuman language (Hinton 1991:152), which was spoken where Luiseño is now.

The Luiseño doublet *'pawxit* ~ *wi'xet* could have developed in several ways. By one scenario, *wi'xet* first took on the general meaning ‘boat’, as in Kitanemuk. *'pa-wxit* would derive separately for the two senses of *wi'xet*, to mean ‘large pine’ and ‘large boat’, the latter referring to wooden boats. The semantic range of *wi'xet* ‘boat’ would then shrink to refer only to the lesser, tule-made boats.

In another scenario, Luiseño *'pa-wxit* ‘ponderosa pine’ would derive from *wi'xet* ‘pine’. Next, *'pawxit* would have taken the secondary meaning ‘wooden boat’, after the Chumash model. And finally, *wi'xet* would have taken on the meaning ‘lesser boat (i.e., tule boat)’ by back-formation based on *'pawxit*, i.e., ‘big pine’ : ‘big boat’ → ‘(smaller) pine’ : ‘(smaller) boat’. This scenario is more complex, but, as in Chumashan, associates the wooden boat with the particular type of pine from which it is made.

Notably, Gabrielino did not adopt ‘pine’ as a metaphor for either the tule boat or the plank boat. Semantic shifts are in general not predictable, and so any historical conclusions based on this are uncertain; however, it may be that the ancestors of the Gabrielino were not initially bilingual in Chumash, and so used neologisms unmotivated by Chumash semantics to describe the local boats.

10.5 Other Boat Terms in Southern California

Some other boat terms occur in Southern California, which are of interest to the discussion here.

10.5.1 Kawaiisu *kwijakata* ‘tule boat’

Zigmond et al. (1991) give the Kawaiisu form *kwijakata*, ‘tule balsa said to be used by the Yokuts’. This is clearly a loan from *kwiakt* of the neighboring Kitanemuk, showing its irregular *w > kw*. This implies that the Kawaiisu came to be in the vicinity of Lake Buena Vista after the Kitanemuk, and after the Chumash had developed the word *tomol(o)* ‘boat’ and passed it as a semantic loan to the Kitanemuk. This is consistent with the chronology of Sutton (2010a).

10.5.2 Kitanemuk *tomoł* ‘large boat’

Anderton (1988:380) gives Harrington’s form *tomoł*, ‘big ship, canoe, steamship’, and notes it as a subset of the more general *kwekt/kwiakt* ‘boat’ discussed above. This Chumashan loan refers to European ships, but it is not clear whether it refers to the Chumash plank boat as well. *ł* is not a native Kitanemuk phoneme but occurs in Chumashan as an allophone of *l*. This appears to be a late loan, perhaps even post-mission.

10.5.3 Ventureño Chumash *?axipenef* ‘dugout canoe’

Klar and Jones (A:472, B:374) discuss the Ventureño form *?axipenef*, ‘dugout canoe’, analyzed as *?axi-pen-ef* {work.wood-strip.off-RESULTATIVE} ‘worked timber’ (see Hudson and Blackburn 1982:338). The verbal stem *?axi-pen* ‘to work wood’ is recorded in Barbareño and Ineseño as well (Whistler 1980; Applegate 2007) and the etymology is transparent. But Klar and Jones’s statement that “the word is probably from an old stratum of Chumashan development” is not necessarily true. The word is as easily explained as a later replacement for an earlier term, *tomol(o)*, which went from signifying ‘dugout boat’ to ‘plank boat’, as I propose, with *?axipenef* filling the semantic gap left behind.

10.5.4 Purisimeño Chumash <šwašwax> ‘canoe’

Pinart’s 1878 vocabulary of Purisimeño gives the form <šuašuax>, ‘canoe’ (Heizer 1952:44-45). This is the only known record of this form. Klar and Jones (B:395-397, D:89, E:174-175) discuss it as a possible older word for ‘canoe’ in general, one predating *tomol(o)*.⁸⁵

The exact phonetic form heard by Pinart is uncertain. Some of the words he recorded bear a final <x> which corresponds to a phonemic /x/ in other, more phonetically reliable sources. For example, his Ventureño <tsitsalsax> ‘thumb’, corresponds to Barbareño *its’alxax* (Whistler 1980), and his Ineseño <suačax> and Ventureño <čuačax>, ‘arm’, match Barbareño *watf’ax*. In other cases the final orthographic <x> occurs where the word actually ends with a phonemic vowel or semivowel, e.g., Ineseño <mohox> ‘beach’ for *muhuw* (Applegate 2007), or Roseño <huimax> ‘Santa Rosa Island’ for *wi²ma* or *wima²* (Whistler 1980; Applegate 1974:194). In the

⁸⁵ Klar and Jones suggest that the name *swaxil*, a village on Santa Cruz Island, derives from this root and means something like ‘boat place’ (B:395, 397). They do not give any other examples of a Chumash suffix *-il* or a similar compound-forming root, in placenames or elsewhere, and I haven’t found any either.

latter cases I read Pinart's <x> as a mishearing of a devoiced echo vowel, e.g., [*wimaʔa*] in the last example.

With the latter interpretation, <šwašwax> could be [*ʃwafwaʔa*], a reduplicated form of *ʃwaʔa*. If we allow for *ʃ~s* alternation (Applegate 1972:60-61; Klar and Jones E:182; but see Klar 1977:127), then this root could be read as *swa* or *swaʔa*, 'tule, *Scirpus* sp.' (Heizer 1952:55; Timbrook 2007:203, 206). With that, *ʃwafwaʔ* could have meant 'tules' and referred to a tule boat.

Other than the *ʃ~s* alternation, this etymology suffers from uncertainty in the identification of the particular species of *Scirpus* which *swa* refers to. Of the several species of tule which grow in the area, only round tule, *Scirpus acutus*, is suitable for building tule boats. Timbrook (2007) has Ineseño *swaʔ* '*S. americanus*, *S. pungens*', but also has Ineseño *swow* '*S. acutus*'. Pinart (in Heizer 1952:54-55) records <sua> as 'tule' in Purisimeño but <sūa> 'round tule' in Barbareño. It is not clear if this variation reflects true dialectal differences or if it reflected imperfect knowledge of plant names by the speakers who supplied these words.⁸⁶

10.5.5 Miscellaneous Luiseño Words for 'boat'

Harrington (Boscana 1978:113) records several additional Luiseño boat words. *wotilaf* 'rowboat' (also Harrington 1986, 3:115:141) derives from *woti* 'to row'. *yalilaf* 'floating thing, boat, raft' (see also Elliott 1999) derives from *ya:la* 'to float', possibly a loan translation from 'Iipay 'Aa (Mesa Grande Diegueño) *kutu:ya:lp* 'boat', lit. 'that which floats, is carried by water' (Couro and Hutcheson 1973). The root *ya:la* itself is a Yuman borrowing with cognates elsewhere in the family ('Iipay 'Aa *tu:yalp* 'carried away by water'; Cocopa *yalyal* 'float, as paper on water', Crawford 1989).

Harrington also records the Spanish loans *voti* (<*bote* 'dinghy'), *vuki* (<*buque* 'ship') and *vapor* (<*vapór* 'steamship').

Gatschet (1879) has the Luiseño ('Kechi') word <*ē-val*> for 'canoe', recorded by Eric Bergland. This appears to be *?i:va-l* 'large wooden spoon, trowel, stirring paddle; species of wood used in making earthenware' (Elliott 1999). It could be a semantic extension of the word referring to the implement, or refer to a dugout made from that type of wood.

11 Reconstructing the Prehistory of Wooden Boats in Southern California

In historical times, Chumash canoe planks were usually fashioned from driftwood, of which coastal redwood (*Sequoia sempervirens*) was the preferred species (Hudson et al. 1978:47-49). Redwood is resistant to weathering, strong, light, straight-grained, shrinks little, and is easy to

⁸⁶ The Chumashan *swa~swax* or *ʃwa~ʃwax* resembles words for 'boat' or 'canoe' in several California languages: Northern Paiute *saki* (Hale 1846); Coast Miwok *šaka* (Callaghan 1970); Plains Miwok *soka* (Merriam 1903c); Northern Valley Yokuts *ʃua* (Kroeber 1959:10). Some of these might be related genetically or through contact; that remains to be investigated. Callaghan (2001:322) suggests linking Coast Miwok *šaka* and Proto Maiduan **dʒak* 'bridge, boat' through contact.

The Chumashan *swa* 'tule, *Scirpus* sp.' and Gabrielino *swa:-r* 'Mission tule (*Juncus textilis*)' (Merriam 1903b) may be related to each other, and perhaps to some of the words for 'boat' above. Munro (1983:290) derives Gabrielino *swa:-* from a protoform **siya-*. Cf. also the Ventureño *syit* 'base of stems of *Juncus textilis*' (Timbrook 2007) and the Gabrielino <Se'-e> 'Round tule, *Scirpus lacustris*' (Merriam 1903b).

work (Anonymous 1999:1-16 and passim), which makes it a superior material for planked boat construction. Abundant driftwood is carried south to the Santa Barbara Channel by the California current. Why, then, was *tomol(o)* ‘pine’ used as the Chumash metaphor for the planked boat, rather than *wi²ma* ‘driftwood, redwood’?⁸⁷

According to Hudson et al. (ibid.), pine and other wood types were considered potential boat timber. *tomol* (yellow pine) was the next best thing to redwood, and it appears that even inferior woods such as Torrey pine could be used when nothing else was available. Blackburn (1975:209) quotes a Chumash tale in which Coyote travels to a location called *tomto²mol* or *hultomto²mol* (‘the pines’) to buy “*tomol* pine boards” from an old man there.⁸⁸ He then carries them home and goes on to build some plank boats with them. While this story lends weight to accounts of the occasional use of pine for boat planks, it also highlights the difficult requirement of transporting a boat’s worth of wooden planks, some 100-200 kg, from deep in the mountains to the seashore.

I propose here that the Chumash plank canoe evolved from dugouts, similar to those attested in historical times among the Luiseño, and that it was this type of boat that was first named after yellow pines, the material used in their construction.

11.1 Dugout Boats in Southern California

11.1.1 Channel Chumash Dugouts

The Chumash built dugout canoes in addition to the *tomol*, though these are less well documented (Woodward 1934:120; Heizer 1955:151, after Henshaw; Hudson et al. 1978:31-37; Hudson and Blackburn 1982:338-340, mostly after Harrington; Cunningham 1989:61-63). Woodward’s ultimate source, Father Antonio Ripoll, lived in Santa Barbara around 1820. He describes dugout canoes, symmetrical in shape, 10m long by 1m deep and wide, carved out by stone tools. There is no mention of the use of fire to hollow the logs. Hudson et al. describe dugout construction as recounted to Harrington by Fernando Librado and perhaps others. These boats were made of willow (*Salix* sp.) or cottonwood (*Populus trichocarpa*). These are large, fast-growing trees which grow near streams at low elevations, but their wood is very heavy when unseasoned, and therefore makes boats of low freeboard which are not suitable for the open ocean; such heavy boats also carry less weight. In general, dugouts were hollowed by repeated burning and gouging. The boats were not stable, and were not used in the open ocean. Henshaw appears to describe the canoes of Santa Rosa island as dugouts made with stone tools alone, without fire. Some post-missionary dugouts were hollowed by mechanical means alone, and were outfitted with benches and oarlocks in European fashion.

Several studies (Heizer 1940; Robinson 1942:208-209; Lee 1981:51; Cunningham

⁸⁷ Barbareño *wi²ma* ‘plant sp.: red pine’ (Whistler 1980); Ineseño *wima²* ‘redwood’ (Applegate 2007). In Hudson et al. (1978) the word refers to driftwood in general and redwood in particular, and is also the name for Santa Rosa Island, presumably because much driftwood is found there.

⁸⁸ *tom~to²mol* {REDUP~pine} ‘pines’, *hu=1-tom~to²mol* {REMOTE=DEF-REDUP~pine} ‘the pines’ in Barbareño, the native language of the storyteller, Juan de Jesús Justo; see Wash (2001:59, 61).

In the story, coyote announces he will be gone for three days, then finds the plank seller, buys the planks, and takes them back in a carrying net. It seems clear that he is carrying the wood from a mountain location, where the trees are, not a coastal one. Therefore I read *tomto²mol* as ‘pines’, rather than ‘boats’. I don’t know the actual location of the place.

1989:62-63) describe miniature boat effigies which have been found in Chumash areas on the mainland and the channel islands. Some of these effigies can be confidently recognized as depicting Chumash-style plank canoes, but recognizing other as depicting dugouts is more ambiguous. For example, the boat effigy of Sequit Canyon described by Cunningham has nearly symmetrical pointed ends, consistent with the descriptions of Harrington and Henshaw, but a strongly curved keel, which does not fit easily with the description of the Chumash dugout.

Heizer and Massey (1953:298) argue that the Chumash dugout was a post-missionary introduction, probably from the Luiseño. They base this on the observation that many planked canoes were seen among the Chumash by early travelers, but no dugouts were described until Ripoll's account of the 1820s. This argument is weak, since the lack of early observations indicates only that planked canoes were predominant, and does not exclude dugouts as a minor type of boat. The Chumash probably had the knowledge of producing dugouts at the time, but not utilized it very often, as was the case with tule boats, which are missing from the early records as well. In any case, the existence of the pine=boat equation in Luiseño, Chumash and Kitanemuk indicates earlier sharing of boat-building knowledge among the people of the area, and certainly predating Costansó's record (Costansó 1770:40) of the Barbareño Chumash word *tomol*.

11.1.2 Northern Chumash and Salinan Dugouts

Further north, some record exists of dugout boats at the northernmost corner of coastal Chumash territory, where it meets Salinan territory. On his voyage south from British Columbia in 1793, Vancouver spotted a few kilometers off the coast between San Simeon and Morro Bay a boat, "neatly formed of wood, much after the Nootka fashion" (Vancouver 1984:1087, Menzies and Eastwood 1924:314), and paddled by four people. He got close enough to recognize the shapes of the paddles, which suggests that he would have recognized the boats as built of planks if they were so, but instead recognizing them as dugouts, as are those of the Nootka (the Nuuchahnulth of Vancouver Island). Alternatively, Heizer and Massey (1953:301) propose that the canoe was one of two plank boats purchased by the mission at San Luis Obispo from the Santa Barbara Chumash, some twenty years earlier.

Early in the twentieth century, Harrington's Migueleño Salinan consultants Pacifico Archuleta and Juan Solano described dugout canoes made by burning the interior of a log of oak or live oak (*Quercus* sp.), or of sycamore (*Platanus racemosa*). Archuleta had seen them on the beach in what is now Cayucos (Harrington 1986, 2:84:233, 127, 128; Immel 2007). The Antoniaño Salinan David Mora told Harrington only of tule boats, which he considered superior to plank boats by being lighter and harder to sink (Harrington 1986, 2:87:461). It appears from these fragmentary data that the Antoniaño, whose territory reached the coast (Gibson 1982), did not use dugouts. The testimony of the Migueleño Salinans, who lived inland, refers to dugout usage by their neighbors of Estero Bay, but no further north.⁸⁹ As in the description of the dugouts of the channel Chumash, the use of heavy timber, here oak and sycamore, precludes the use of these boats on the open ocean. Notably, there is no historical record of the use of ponderosa pine, even though stands of it grow near the coast, north of San Simeon. As with the

⁸⁹ Cayucos, the point in question, is on what may have been the boundary between the northernmost Chumash and the poorly described Playanos to the north. Whether the Playanos were a distinct ethnic group, and if so whether they were Chumashan, Salinan, or something else, is not known (Milliken and Johnson 2003:128-134).

Chumash dugout, the use of fire rather than just mechanical means argues against a European source for this technology. Despite this ethnological record of the use of dugout canoes, the archaeological record shows no significant evidence for offshore fishing in the area at any time in the past (Joslin 2010).

11.1.3 Luiseño Dugouts

The Luiseño are the only group in the area which used dugouts as a significant means of water transport in historical times.⁹⁰

Some wooden canoes were also made from the trunks of trees. It is stated that voyages were formerly made with these as far as San Clemente Island. [Sparkman 1908:200]

Pauhut, canoe (also a box hollowed out of a log to keep things in)...*pauhit*, yellow pine, also dug-out canoe [of cottonwood?]. [DuBois 1908:131]

[Marcus Golsh] reported stories that his grandfather had told of making canoes on the forest-mantled slopes of Paauw [*pa'ʔa:ʔaw*, Mount Palomar], at the Pine Camp of Uuszkun [*ʔuʔufkun*, Doane Valley]. These fire-and-abrasion hulls of yellow pine were finished late in the fall, so that after abatement of winter storms they could be paddled down tributary streams to the River San Luis Rey and out to the coast, where they were sold to shore-side villages for use at sea. [Cunningham 1989:61-62]⁹¹

Cunningham's account highlights the significance of log transportation methods to the feasibility of constructing dugout canoes. Ponderosa and Jeffrey pines grow in Southern California at elevations above 1500m (Burns and Honkala 1990). Mt. Palomar, some 50 km from the coast, is the nearest location where these pines grow. Doane Valley, according to Harrington (Boscana 1978:113), is the only place on Mt. Palomar where yellow pine grows. According to Golsh, the Luiseño also traded logs burned into charcoal to the islanders; these were brought down from the mountains, presumably in the same way, then tied together into rafts and floated across the channel (Cox 1968). Water transport through swollen rivers, as described, is the only practical way to get logs or dugouts from these mountains to the coast.

11.1.4 Explaining the Distribution of Dugout Boats

This constraint on log and canoe transportation severely limits the locations where dugout canoes can be built and launched. The only large rivers in Southern California which drain an area where yellow pines grow are the San Luis Rey, discussed above; the Santa Ana, which travels

⁹⁰ Boscana (1978:24) wrote in his 1822 Luiseño ethnography, "they constructed out of logs very swift and excellent canoes for fishing." From the context, however, this appears to refer to the Chumash, not the Luiseño. This quote is known only from a translated version (Robinson 1846:240). It does not appear in the only known version of the Spanish original (Reichlen and Reichlen 1971).

⁹¹ Marcus Golsh (1890-1988) was a Rincón Luiseño tribal leader. His grandfather was Santiago Duro. This passage is to be read with some caution, since Cunningham may have woven together Golsh's report with some of Harrington's notes to Boscana (1978). However, the passage is consistent enough to be acceptable in its entirety. Cunningham says he elicited this account from Golsh on several different occasions.

from the San Bernardino mountains to the shore in Orange County; the San Gabriel, which drains the San Gabriel mountains and ends near Long Beach; the Santa Clara, which meets the Pacific in Ventureño Chumash territory; and the Santa Ynez, which reaches the coast in Purisimeño Chumash territory, near Lompoc. Stands of ponderosa pine also grow very close to the coast to the north, around San Simeon and south of Big Sur. As with the San Luis River, heavy flow in these rivers is limited to the late winter and early spring (see Horne 1981:20 for the Santa Clara River).

This partly explains the distribution of dugout canoes in Southern California: dugouts existed only where they could be built out of suitable material (yellow pine) and transported to the coast. The Gabrielino, by this argument, did not have dugouts because the long, shallow and intermittent San Gabriel River was not adequate to carry pine dugouts from the San Gabriel mountains to the coast.⁹² Other rivers, such as the Santa Ana and Santa Ynez river, may have been capable of transporting logs and boats but required a long travel from source to coast.

In all three areas — Luiseño, Santa Barbara Channel Chumash, and Northern Chumash — heavier woods such as cottonwood, sycamore or oak were used in historical times for building dugout boats for coastal use. This appears to be a late development, probably later than the arrival of Europeans, the establishment of the missions, and the cessation of travel to the islands. For traveling and fishing near the shore and in esteros such boats would have sufficed, and the woods from which they were built were from easily accessible coastal trees. It is very possible that the transportation of dugouts from inland always required a large number of people, even assisted by rivers, and that the depopulation of native communities after European contact made such projects harder to carry out.

There is no record of dugout canoes used on the California coast from north of Salinan territory until reaching Wiyot territory some 500 km to the north (e.g., Kroeber 1922:269), although tule boats were used in Monterey and San Francisco bays.⁹³ This cannot be explained entirely by the lack of appropriate wood. For example, redwood grows abundantly in the Santa Cruz mountains south of San Francisco, and reaches close to the coast near Santa Cruz, and could have been fashioned into dugouts. Even in far northern California, ocean-going dugout canoes are not designed for open ocean navigation (Hudson 1981b).

By one argument, oceangoing boats, including dugouts, were scarce along the central California coast because of the difficulty of navigation in that exposed area (Arnold and Bernard 2005:110). There may be some truth to that, but sailing in that area is not always excluded, and even in the supposedly sheltered Santa Barbara Channel safe sea and weather conditions are not guaranteed (Fagan 2004:7-8).

It appears, then, that the distribution of wooden boats in coastal California was not conditioned solely on availability of wood, on ocean conditions, or on access to offshore

⁹² There is one mention of the transportation of a large log from the mountains among the Gabrielino (McCawley 1996:161-164). A certain mourning ceremony, held every few years, required the erection of a 10-15m pole, which was cut from a pine tree and brought back to the ceremony area in the valley. There are no more details about the method of transportation, but it cannot have been easy, and transporting logs or dugouts all the way to the coast would have been more difficult still.

⁹³ Pinart's vocabulary of Esselen records the item <ualkošex> 'canoe (dugout)' (Heizer 1952:76). There is no other indication that the Esselen ever used any boat other than a tule boat. Fish remains from Esselen territory (Breschini and Haversat 2004:119) are limited to near-shore species, suggesting minimal use of boats. Esselen territory is mountainous down to the coast, and lacks large coastal plains suitable for settlements.

fisheries. The best predictor of their presence is the need for transportation to the islands off the coast. As Sparkman has noted for the Luiseño, dugouts were used for travel to the islands (*pace* Fagan 2004). Dugouts were built in Southern California because they provided a good means for reaching the Channel Islands, and were built wherever appropriate wood was available.

The dugouts of the northernmost Chumash, far from the Channel Islands, are an exception to this. Apparently they were used for fishing, in preference to tule boats, but at present I do not know if that was due to absence of tule, the availability of ponderosa pines near the coast, or some other reason.

11.1.5 Dugouts: Summary

I have argued that dugout boat construction was traditionally known throughout Southern California, and that dugouts were built for the purpose of travel to the Channel Islands. The Luiseño dugout is known to have been constructed of yellow pine transported from the mountains to the coast, and took its name, *pawxit*, from the name of the tree. The boat of the neighboring Chumash likewise took its name from the Chumash word for the yellow pine, *tomol*, and must have likewise been a pine dugout, with one language borrowing the secondary meaning from the other. This is easily consistent with the Chumash plank canoe developing after the dugout but retaining the earlier name, but not with scenarios involving an introduced plank canoe accompanied by a borrowed name.

11.2 From Dugouts to Plank Boats

Dugout construction required the transport of a heavy and unwieldy boat from the mountains over rough terrain or by the lucky placement of a river. The Chumash plank canoe did not have this disadvantage. Logs can be split into planks, which can be transported to the coast in several trips and even uphill. Easier yet, planks could be fashioned from driftwood found in coastal areas, which often was of the more durable redwood.

This provides clues to the transition from dugout to plank boat among the Chumash. Increasing contact with the islands and exploitation of ocean resources required more numerous and larger boats, while the number of dugouts which could be transported to coast through the Santa Clara river at times of high flow (Horne 1981:20) was limited. The development of planked canoe technology overcame this limitation and allowed for the production of a great number of voluminous and seaworthy boats, as was already suggested by Heizer (1938:221).⁹⁴

This scenario of transitioning from dugout to plank canoes finds a parallel in East Polynesia. At the time of European contact, the most elaborately developed fully-planked boats in East Polynesia were found in the Tuamotus, a chain of low-lying atolls, poor in large, high-quality trees. Tuamotuan planked canoes were seaworthy, and often very large; they were so highly valued that they were exported to the richer and larger Society Islands, and sometimes Tuamotuan boat-builders would be brought there as well (Haddon and Hornell 1936:79).

⁹⁴ It is also conceivable that sometime in the past climatic conditions in Chumash territory were favorable to the growth of yellow pine at lower elevations, including the slopes of the Santa Ynez mountains above Santa Barbara, and that changing conditions moved the range of yellow pine further inland and forced the Chumash to find more accessible wood and techniques for its use. Direct evidence for the past abundance of pine, based on pollen records from the region, is ambiguous (Heusser 1978; Heusser 1995; Davis 1992), and provides no species-level detail; this scenario remains a speculation.

Evidently the lack of large timber and the necessity of frequent travel among many small, widely-scattered islands led to the development of these boats, which were more labor-intensive, but ultimately more versatile than the dugouts fashioned from the larger trees of the high islands. I believe that this same path was followed in the development of the Chumash plank canoe, especially on the timber-poor but driftwood-rich northern Channel islands.

There is no remaining evidence of the intermediate stages between the simple dugout and the *tomol*, but dugouts may well have been more complex in the past. For example, they may have been made more seaworthy by widening and flattening the hull, or by the addition of one or more layers of strakes. If dugout canoes were used for deep sea fishing before the transition to fully formed plank boats, the timing of the invention of the *tomol* based on early fish remains, as proposed by Bernard (2001, 2004) and Arnold and Bernard (2005), may have to be reconsidered.

11.3 Plank Boats Outside the Santa Barbara Channel

Outside the Santa Barbara channel, plank boats were used by the Gabrielino to the south as far as San Pedro. Plank boats were encountered in the northern Channel Islands, and on San Clemente and Santa Catalina islands (Wagner 1928:47; Vizcaíno 1959).

Details on the Gabrielino plank boat are lacking, but it was apparently similar to the *tomol*. The only known difference is the shape of the prow and stern, inferred from boat effigies (Hudson et al. 1978:96-97); this detail might reflect different uses of the boat in these two areas. While there exist abundant early observations of Chumash boat construction, no such evidence exists for plank boats manufacturing in Gabrielino territory. Triangular stone drills, with which the Chumash drilled holes in canoe planks, do not appear in the Gabrielino archaeological record. These two observations have led Cunningham (1989:76) to propose that the Gabrielino obtained plank boats from the Chumash, rather than manufacturing them themselves. And indeed the Gabrielino would not have been able to obtain boat construction material easily, whether redwood drift logs, probably limited to the eastern part of the Santa Barbara Channel, or pine planks, which would require transportation by land over a great distance and mountainous terrain. The same argument applies to the island Gabrielino of Santa Catalina, and possibly to the people of San Clemente as well; more information about driftwood abundance there would clarify the issue.

Plank boats were expensive to produce, and the Gabrielino would have needed material wealth to trade for them. Such wealth was generated through the natural resources of Santa Catalina, including shells for ornaments and steatite (McCawley 1996:112). As the inhabitants of the southern Channel Islands were Gabrielino (Hudson 1981a; Sutton 2010b) or anyway Takic speakers (Munro 2002), their boats may have ultimately been supplied through the mainland Gabrielino. In any event, plank boats were not as ubiquitous among the Gabrielino as among the Chumash, as attested by the use of tule boats for ocean travel among them (McCawley 1996:125).

The Luiseño did not use plank canoes. Their dugouts, as mentioned before, have gone as far as San Clemente, and would have reached Catalina even more easily. But in both places the more distant Luiseño and their boats must have had a lesser presence than the Gabrielino. Accordingly, their share of the wealth of these islands would be small, and they would not have had the means to trade for Chumash plank boats. This lack of plank canoes may explain why the Luiseño continued to use dugouts up to the early historical period.

12 Explaining the Distribution of Planked Boats in the Americas

Plank boats are rare in the Americas, especially compared with the rest of the world. As I have shown, plank canoes developed in Southern California from dugout canoes, out of the necessity for seaworthy boats capable of crossing from the mainland to the Channel Islands, over distances of tens of kilometers. On the west coast of the Americas, no other such islands or wide bights exist between the Olympic Peninsula on the Canadian border and Chiloé Island in Chile, with the exception of the Coiba and the Perlas Islands off the coast of Panama.⁹⁵ In the Pacific Northwest, very large trees were available for building beamy dugouts, and even those required sewn-on strakes for handling the waves through long crossings, as was discussed above in section 3. Other offshore islands throughout that area were either too small to be useful (e.g., the Farallon Islands, off San Francisco), too remote to be familiar, or close enough to shore to be reachable by boats of modest capabilities (e.g., Cedros Island off Baja California). In polar and sub-polar areas of the Americas, where workable lumber is rare, bark boats and animal skin boats are seaworthy substitutes for wooden boats. The sewn-plank boat of the Patagonian coast, the *dalca*, was developed by adapting the sewn-bark boats of the Chono from the south for use with the wooden planks of the Huilliche from the north (Lothrop 1932:249, 251). The *dalca* was developed not only for seaworthiness, but also to be easily disassembled and transported over land (Lothrop 1932:247). Southern California is the only locality on the west coast of the Americas where large islands off the coast required open crossings, and where arid climate limited the availability and accessibility of suitable trees for dugout construction.

On the east coast of the Americas, a similar situation holds. The only place where offshore islands required open crossings was in the Caribbean, and there large logs suitable for dugout construction were available. As in the Pacific Northwest, the technique of sewing planks on to a dugout base was developed there to increase the seaworthiness of the boats.

In contrast, the coasts of Asia, the Mediterranean and Europe are surrounded by abundant targets for seaworthy boats. And, of course, ocean navigation was at the heart of the settlement and daily life of Oceania. In all of these areas, dugouts with sewn-on strakes and fully planked boats were known until the advent of metal nails and metal tools.

The east coast of Africa, while free of islands or large bays, was frequented until recently by planked boats, part of the large trade network which stretched across the Indian Ocean. The area most analogous to the smooth coasts of the Americas is the west coast of tropical Africa south of Senegal, where ocean navigation was mainly along the coast, and where planked boats and sewn-on strakes were unknown (Smith 1970), as in most of the Americas.

13 Conclusion

Jones and Klar have presented what they consider archaeological, ethnological and linguistic evidence for a Polynesian origin of the plank canoe of Southern California. I have shown here that none of that evidence is valid. There is nothing to show that the Chumash *tomol* and the Gabriellino *ti'at* were inspired by external contact.

Linguistic and ethnographic evidence from Southern California suggests a long history of pine-built dugout canoes, which would be the ancestors of the Chumash plank canoe. The homonymy of the words for 'pine' and 'boat' in Barbareño and Roseño Chumash, in Luiseño,

⁹⁵ The natives of Coiba and of the Perlas archipelago were exterminated soon after European contact. I know of no information regarding their boats.

and in Kitanemuk supports this model, and points out some new historical detail.

The equivalence of Chumashan *tomol* ‘yellow pine; plank boat’ and Luiseño *pawxit* ‘yellow pine; dugout’ and *wixet* ‘pine; tule boat’ indicates that both communities shared the technology of dugouts built of yellow pine. The Chumash later elaborated the dugout into the familiar plank boat, with the dugout remaining a marginal form. It would be difficult to reconcile an external introduction of the plank canoe into Chumash territory with the usage of the parallel term by the Luiseño to describe their dugouts.

The semantics of the Chumashan *tomol* guide those of the Kitanemuk *kwekt* and *kwiakt*, originally meaning ‘pine’, but later referring to the tule boats of the Yokuts of Buena Vista Lake. Buena Vista Lake has existed since ca. 2000 BC (Kennett et al. 2007:537), and was presumably navigated soon thereafter, by whatever people lived by its shores. According to Sutton (2010a), the ancestors of the Kitanemuk arrived at their historical homeland at about that time. By the simplest linguistic scenario, these Uto-Aztecan settlers then came in contact with Chumash speakers, and fashioned their word for ‘boat’ after the Chumash model.⁹⁶ Coastal Chumashan speakers therefore already had dugouts made of yellow pine and called something like *tomolo* by ca. 2000 BC. That places the origin of the word thousands of years before the arrival of humans in Polynesia, and before the earliest evidence of planked boats in California. Since dugouts appeared millennia before the first evidence of deep-sea fishing in the area, their creation was motivated by some other needs, such as safety or increased cargo weight, in which they were superior to tule boats. Lastly, when the ancestors of the modern Kawaiisu arrived at their present location, perhaps about AD 1000 (Sutton 2010a), they borrowed the Kitanemuk word for the Buena Vista tule boats, *kwiakt*, as *kwijakata*.

In the model given here, the plank canoe was innovated in southern California because of the increased need for large, seaworthy boats which could frequently travel to the offshore islands of the channel, coupled with the lack of accessible trees suitable for building large dugouts. This model explains the rarity of sewn-plank canoes in the Americas, and helps explain their distribution in the rest of the world.

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References

Académie Tahitienne. 1999. *Dictionnaire tahitien-français*. Fa’atoro Parau Tahiti/Farāni. Pape’ete: Fare Vāna’a.

Alliott [Alliot], Hector. 1917. Pre-historic Use of Bitumen in Southern California. *Bulletin of the*

⁹⁶ It is possible in principle that they had originally another word for the tule boat and replaced it with *kwekt*–*kwiakt* later, but there is no clear reason or motivation for such a replacement.

The Plank Canoe of Southern California

Southern California Academy of Sciences 16(2):41-44. Los Angeles.

- Anderson, Atholl. 1991. The Chronology of Colonization in New Zealand. *Antiquity* 65(249): 767-795.
- Anderson, Atholl. 1994. Palaeoenvironmental Evidence of Island Colonization: A Response. *Antiquity* 68(261):845-847.
- Anderson, Atholl. 2000. Differential Reliability of ¹⁴C AMS Ages of *Rattus exulans* Bone Gelatin in South Pacific Prehistory. *Journal of The Royal Society of New Zealand* 30(3):243-261.
- Anderson, Atholl. 2006. Polynesian Seafaring and American Horizons: A Response to Jones and Klar. *American Antiquity* 71(4):759-763.
- Anderson, Atholl, Eric Conte, Patrick V. Kirch, and Marshall Weisler. 2003. Cultural Chronology in Mangareva (Gambier Islands), French Polynesia: Evidence from Recent Radiocarbon Dating. *Journal of the Polynesian Society* 112(2):119-140.
- Anderson, Atholl, and Yosihiko Sinoto. 2002. New Radiocarbon Ages of Colonization Sites in East Polynesia. *Asian Perspectives*, 41(2):241-257.
- Anderton, Alice J. 1988. *The Language of the Kitanemuks of California*. Ph.D. dissertation (linguistics), University of California, Los Angeles.
- Andrews, Edmund, and Irene D. Andrews. 1944. *A Comparative Dictionary of the Tahitian Language*. Chicago: Chicago Academy of Sciences.
- Andrews, Lorrin, and Henry H. Parker (reviser). 1922. *A Dictionary of the Hawaiian Language*. Honolulu: Board of Commissioners of the Public Archives of the Territory of Hawaii.
- Anell, Bengt. 1955. *Contribution to the History of Fishing in the Southern Seas*. Studia Ethnographica Upsaliensia, vol. 9. Uppsala.
- Anonymous. 1939. The Canoe Making Profession of Ancient Times. Translated by Mary Kawena Pukui. Edited and annotated by Kenneth P. Emory. Preface by Maude Jones. *Occasional Papers of Bernice P. Bishop Museum* 15(13):149-159. Honolulu.
- Anonymous. 1999. *Wood Handbook — Wood as an Engineering Material*. Gen. Tech. Rep. FPL-GTR-113. Madison: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory.
- Applegate, Richard B. 1972. *Ineseño Chumash Grammar*. Ph.D. dissertation (linguistics), University of California, Berkeley.
- Applegate, Richard B. 1974. Chumash Placenames. *Journal of California Anthropology* 1(2):187-205.

- Applegate, Richard B. 2007. *Samala-English Dictionary: A Guide to the Samala Language of the Ineseño Chumash People*. Santa Ynez, CA: Santa Ynez Band of Chumash Indians.
- Arnold, Jeanne E. 2007. Credit Where Credit is Due: The History of the Chumash Oceangoing Plank Canoe. *American Antiquity* 72(2):196-209.
- Arnold, Jeanne E., and Julienne L. Bernard. 2005. Negotiating the Coasts: Status and the Evolution of Boat Technology in California. *World Archaeology* 37(1):109-131.
- Arredondo Bravo, Ana Maria. 1988. Medicina Tradicional en Isla de Pascua. *Clava* 4:11-33. Viña del Mar, Chile: Sociedad Fonck.
- Arroyo de la Cuesta, Felipe. 1837. Lecciones de Yndios[...] Quaderno de Lengua de San Luis Obispo, de la Purisima, y de Santa Ynes, con las notas gramaticales correspondientes a este idioma prepositivo y preverbal, que no tiene analogia alguna con el Mutsun ni con el Juncaleño. Manuscript. BANC MS C-C 63a. Berkeley, CA: Bancroft Library.
- Athens, J. Stephen, H. David Tuggle, Jerome V. Ward, and David J. Welch. 2002. Avifaunal Extinctions, Vegetation Change, and Polynesian Impacts in Prehistoric Hawai'i. *Archaeology in Oceania* 37:57-78.
- Barrows, David Prescott. 1900. *The Ethnobotany of the Coahuilla Indians of Southern California*. Chicago: University of Chicago Press.
- Bataille-Benguigui, Marie-Claire, Christian Coiffier, Hélène Guiot, Tara Hiquily, Hiriata Millaud, Véronique Mu-Liepmann, Catherine Orliac, Éric Rieth, Vairea Teissier, and Robert Veccella. 2008. *Va'a, la pirogue polynésienne*. Punaauia, Tahiti: Musée de Tahiti et des îles; and Pirae, Tahiti: Au vent des îles.
- Bates, Henry Walter. 1873. *The Naturalist on the River Amazons*. 3rd ed. London: John Murray.
- Bentley, R. Alexander, Hallie R. Buckley, Matthew Spriggs, Stuart Bedford, Chris J. Ottley, Geoff M. Nowell, Colin G. Macpherson, and D. Graham Pearson. 2007. Lapita Migrants in the Pacific's Oldest Cemetery: Isotopic Analysis at Teouma, Vanuatu. *American Antiquity* 72(4):645-656.
- Bernard, Julienne L. 2001. *The Origins of Open-Ocean and Large Species Fishing in the Chumash Region of Southern California*. M.S. thesis (anthropology), University of California, Los Angeles.
- Bernard, Julienne L. 2004. Status and the Swordfish: The Origins of Large-Species Fishing among the Chumash. In *Foundations of Chumash Complexity*, edited by Jeanne E. Arnold, 25-51. Los Angeles: Cotsen Institute of Archaeology, University of California, Los Angeles.
- Best, Elsdon. 1925. *The Maori Canoe*. Dominion Museum Bulletin 7. Wellington: W. A. G. Skinner, Government Printer.
- Biggs, Bruce. 1978. The History of Polynesian Phonology. In *Proceedings of the Second*

The Plank Canoe of Southern California

- International Conference on Austronesian Linguistics*, edited by Stephen A. Wurm and Lois Carrington, 691-716. Pacific Linguistics C-61. Canberra: Australian National University.
- Biggs, Bruce, and Ross Clark. 1993. *POLLEX: Comparative Polynesian Lexicon*. Computer database. Auckland: Department of Anthropology, University of Auckland.
- Blackburn, Thomas C. 1975. *December's Child: A Book of Chumash Oral Narratives, Collected by J. P. Harrington*. Berkeley: University of California Press.
- Blixen, Olaf. 1972. La oclusión glótica del pascuense y algunas observaciones sobre la posición del pascuense dentro del grupo de lenguas polinésicas. *Moana* 1(5):1-20. Montevideo.
- Blust, Robert. 2004. *t to k: An Austronesian Sound Change Revisited. *Oceanic Linguistics* 43(2):365-410.
- Boas, Franz. 1909. The Kwakiutl of Vancouver Island. Memoir of the American Museum of Natural History (New York). *The Jesup North Pacific Expedition*, edited by Franz Boas, vol. 5. Leiden: Brill, and New York: G. E. Stechart. Reprinted 1975, AMS Press.
- Boscana, Gerónimo. 1978. *Chinigchinich... Historical Account of the Belief, Usages, Customs and Extravagancies of the Indians of San Juan Capistrano, called the Acagchemem Tribe...* Translated by Alfred Robinson, with annotations by John P. Harrington and preface by William Bright. Banning, CA: Malki Museum Press.
- Breschini, Gary S., and Trudy Haversat. 2004. *The Esselen Indians of the Big Sur Country*. Salinas: Coyote Press.
- Bright, William. 1957. *The Karok Language*. University of California Publications in Linguistics 13. Berkeley: University of California Press.
- Bright, William. 1968. *A Luiseño Dictionary*. University of California Publications in Linguistics 51. Berkeley: University of California Press.
- Bright, William. 1976. Archaeology and Linguistics in Prehistoric Southern California. In *Variation and Change in Language: Essays by William Bright*, edited by Anwar S. Dil, 189-205. Palo Alto: Stanford University Press.
- Bright, William, and Jane H. Hill. 1967. Linguistic History of the Cupeño. In *Studies in Southwestern Ethnolinguistics*, edited by D. H. Hymes and W. Biddle, 352-391. The Hague: Mouton.
- Brindley, Harold Hulme. 1919-1920. Notes on the Boats of Siberia. Part I, *The Mariner's Mirror* 5:66-72; II, *ibid.* 5:101-107; III, *ibid.* 5:130-142; IV, *ibid.* 5:184-187; V, *ibid.* 6:15-18; Notes, *ibid.* 6:187.
- Brindley, Maud D. 1924. The Canoes of British Guiana. *The Mariner's Mirror* 10:124-132.
- Buck, Peter (Te Rangi Hiroa). 1932. *Ethnology of Tongareva*. Bishop Museum Bulletin 92.

Honolulu.

- Burns, Russell M., and Barbara H. Honkala. 1990. *Silvics of North America*. Agriculture Handbook 654. Washington: U.S. Department of Agriculture, Forest Service.
- Buse, Jasper, and Raututi Taringa. 1995. *Cook Islands Maori Dictionary*. Rarotonga, Cook Islands: Ministry of Education, Government of the Cook Islands.
- Butler, Kevin. 2008. Interpreting Charcoal in New Zealand's Palaeoenvironment — What Do Those Charcoal Fragments Really Tell Us? *Quaternary International* 184:122-128.
- Callaghan, Catherine A. 1970. *Bodega Miwok Dictionary*. University of California Publications in Linguistics 60. Berkeley: University of California Press.
- Callaghan, Catherine A. 2001. More Evidence for Yok-Utian: A Reanalysis of the Dixon and Kroeber Sets. *International Journal of American Linguistics* 67(3):313-345.
- Campbell, Lyle. 1997. *American Indian Languages: The Historical Linguistics of Native America*. Oxford Studies in Anthropological Linguistics 4. Oxford University Press.
- Carson, Mike T. 2006. Chronology in Kaua'i: Colonisation, Land Use, Demography. *Journal of the Polynesian Society* 115(2):173-185.
- Cassidy, Jim, L. Mark Raab, and Nina A. Kononenko. 2004. Boats, Bones, and Biface Bias: The Early Holocene Mariners of Eel Point, San Clemente Island, California. *American Antiquity* 69(1):109-130.
- Churchill, William. 1912. Rapanui-English Vocabulary. In *Easter Island, the Rapanui Speech, and the Peopling of Southeast Polynesia*, 185-269. Washington: Carnegie Institution.
- Churchward, C. Maxwell. 1959. *Tongan Dictionary (Tongan-English and English-Tongan)*. Nuku'alofa, Tonga: Government Printing Press.
- Clarke, Andrew C., Michael K. Burtenshaw, Patricia A. McLenachan, David L. Erickson, and David Penny. 2006. Reconstructing the Origins and Dispersal of the Polynesian Bottle Gourd (*Lagenaria siceraria*). *Molecular Biology and Evolution* 23(5):893-900.
- Cooper, John M. 1917. *Analytical and Critical Bibliography of the Tribes of Tierra del Fuego*. Smithsonian Institution, Bureau of American Ethnology Bulletin 63. Washington: Government Printing Office.
- Costansó, Miguel. 1770. *Diario histórico de los viages de mar, y tierra, hechos al norte de la California...* Mexico City: Imprenta del Superior Gobierno.
- Couro, Ted, and Christina Hutcheson. 1973. *Dictionary of Mesa Grande Diegueño*. Banning, CA: Malki Museum Press.
- Cox, Bill. 1968. Indian Nobleman of Pala. *The High Country* 6:14-22. Temecula, CA.

The Plank Canoe of Southern California

- Crawford, James M. 1989. *Cocopa Dictionary*. University of California Publications in Linguistics 114. Berkeley: University of California Press.
- Crespi, Juan. 2001. *A Description of Distant Roads: Original Journals of the First Expedition into California, 1769-1770*. Edited and translated by Alan K. Brown. San Diego: San Diego State University.
- Crook, William Pascoe, Samuel Greatheed, and Tima'u Te'ite'i. 1998 [1799]. *An Essay toward a Dictionary and Grammar of the Lesser Australian Language, According to the Dialect Used at the Marquesas*. Edited by H. G. A. Hughes and S. R. Fischer. Auckland: Institute of Polynesian Languages and Literatures.
- Cunningham, Richard W. 1989. *California Indian Watercraft*. San Luis Obispo: EZ Nature Books.
- Dakin, Karen. 2001. Isoglosas e innovaciones yutoaztecas. In *Homenaje a Wick R. Miller*, edited by José Luis Moctezuma Zamarrón and Jane H. Hill, 313-343. Serie Lingüística. Mexico City: Instituto Nacional de Antropología e Historia.
- Davenport, Demorest, John R. Johnson, and Jan Timbrook. 1993. The Chumash and the Swordfish. *Antiquity* 67(255):257-272.
- Davidson, Keay. 2005. Did Ancient Polynesians Visit California? Maybe So. *San Francisco Chronicle*, June 20, 2005, p. A1.
- Davies, John. 1851. *A Tahitian and English Dictionary*. Tahiti: London Missionary Society.
- Davis, James T. 1961. Trade Routes and Economic Exchange among the Indians of California. *Reports of the University of California Archaeological Survey*, no. 54. Berkeley. Reprinted in *Aboriginal California: Three Studies in Culture History*, edited by Robert F. Heizer, 1963. Berkeley: University of California Press.
- Davis, Owen K. 1992. Rapid Climatic Change in Coastal Southern California Inferred from Pollen Analysis of San Joaquin Marsh. *Quaternary Research* 37:89-100.
- de Vaan, Michiel. 2008. *Etymological Dictionary of Latin and the Other Italic Languages*. Leiden Indo-European Etymological Dictionary Series, edited by Alexander Lubotsky, vol. 7. Leiden: Brill.
- Des Lauriers, Matthew R. 2005. The Watercraft of Isla Cedros, Baja California: Variability and Capabilities of Indigenous Seafaring Technology along the Pacific Coast of North America. *American Antiquity* 70(2):342-360.
- Dickinson, William R. 2003. Impact of Mid-Holocene Hydro-Isostatic Highstand in Regional Sea Level on Habitability of Islands in Pacific Oceania. *Journal of Coastal Research* 19(3):489-502.

- Dickinson, William R. 2009. Pacific Atoll Living: How Long Already and Until When? *GSA Today* 19(3):4-10. Boulder, CO: Geological Society of America.
- Dixon, Roland B. 1910. The Chimariko Indians and Language. *University of California Publications in American Archaeology and Ethnology* 5(5):293-380. Berkeley: University of California Press.
- Dordillon, Ildefonse René. 1904. Grammaire et dictionnaire de la langue des îles Marquises. Paris: Belin Frères.
- DuBois, Constance Goddard. 1908. The Religion of the Luiseño Indians of Southern California. *University of California Publications in American Archaeology and Ethnology*, 8(3):69-186. Berkeley: University of California Press.
- Durand, Jean Baptiste Léonard. 1806. *A Voyage to Senegal*. London: Richard Phillips.
- Durkin, Philip. 2009. *The Oxford Guide to Etymology*. Oxford University Press.
- Durham, Bill. 1960. *Indian Canoes of the Northwest Coast*. Seattle: Copper Canoe Press.
- Dye, Thomas S. 2011. A Model-Based Age Estimate for Polynesian Colonization of Hawai'i. *Archaeology in Oceania* 46:130-138.
- Dye, Thomas S., and Jeffrey Pantaleo. 2010. Age of the O18 Site, Hawai'i. *Archaeology in Oceania* 45:113-119.
- Edgar, Blake. 2005. The Polynesian Connection: Did Ancient Hawaiians Teach California Indians How to Make Ocean-Going Canoes? *Archaeology* 58(2):42-45.
- Edwards, Clinton R. 1965. *Aboriginal Watercraft on the Pacific Coast of South America*. Berkeley and Los Angeles: University of California Press.
- Elbert, Samuel A. 1982. Lexical Diffusion in Polynesia and the Marquesan-Hawaiian Relationship. *Journal of the Polynesian Society* 91(4):499-517.
- Elbert, Samuel A., and Mary Kawena Pukui. 1979. *Hawaiian Grammar*. Honolulu: University of Hawaii.
- Elliott, Eric B. 1999. *Dictionary of Rincón Luiseño*. Ph.D. dissertation (linguistics), University of California, San Diego.
- Emmons, George Thornton. 1991. *The Tlingit Indians*. With additions by Frederica de Laguna and a biography by Jean Low. Anthropological Papers of the American Museum of Natural History 70. Seattle: University of Washington.
- Emory, Kenneth P., William J. Bonk, and Yosihiko H. Sinoto. 1959. *Hawaiian Archaeology: Fishhooks*. Bishop Museum Special Publication 47. Honolulu.

The Plank Canoe of Southern California

- Englert, Sebastian. 1978. *Idioma Rapanui: gramatica y diccionario del antiguo idioma de la isla de pascua*. Santiago: Universidad de Chile.
- Erlandson, Jon M., Torben C. Rick, and Curt Peterson. 2005. A Geoarchaeological Chronology of Holocene Dune Building on San Miguel Island, California. *The Holocene* 15(8):1227-1235.
- Fagan, Brian. 2004. The House of the Sea: An Essay on the Antiquity of Planked Canoes in Southern California. *American Antiquity* 69(1):7-16.
- Finsterbusch, Carlos A. 1934. Las dalcas de Chiloé y los chilotes. *Revista Chilena de Historia y Geografía*. 75(82):412-433. Santiago.
- Fischer, Steven R. 1999. Albert Pearse's comparative Tahitian, Rurutuan, Rimataran, and Ra'ivavaean Vocabulary (1877). *Rongorongo Studies* 9(1):3-22. Auckland, NZ.
- Fornander, Abraham. 1917. *Hawaiian Antiquities and Folk-lore*. 5 vols., 1917-1920. Honolulu: Bishop Museum.
- Fowler, Catherine S. 1983. Some Lexical Clues to Uto-Aztecan Prehistory. *International Journal of American Linguistics* 49(3):224-257.
- Fuentes, Jordi. 1960. *Dictionary and Grammar of the Easter Island Language / Diccionario y Gramática de la Lengua de la Isla de Pascua*. Santiago: Andrés Bello.
- Galloway, Anne. 1978. *Továngar (World): A Gabrielino Word Book*. Banning, CA: Malki Museum Press.
- Gamble, Lynn H. 2002. Archaeological Evidence for the Origin of the Plank Canoe in North America. *American Antiquity* 67(2):301-315.
- Gatschet, Albert S. 1879. Linguistics. Appendix to *Report Upon the United States Geographical Surveys West of the One Hundredth Meridian, in Charge of First Lieut. George M. Wheeler*. Vol. 7, *Archaeology*, 399-485. Washington: Government Printing Office.
- Gibson, Robert O. 1982. *Ethnogeography of the Salinan People: A Systems Approach*. M.A. thesis (anthropology), California State University, Hayward.
- Golla, Victor. 2011. *California Indian Languages: A Research Guide*. Berkeley: University of California Press.
- Gongora, Jaime, Nicolas J. Rawlence, Victor A. Mobegi, Han Jianlin, Jose A. Alcalde, Jose T. Matus, Olivier Hanotte, Chris Moran, Jeremy J. Austin, Sean Ulm, Atholl J. Anderson, Greger Larson, and Alan Cooper. 2008a. Indo-European and Asian Origins for Chilean and Pacific Chickens Revealed by mtDNA. *Proceedings of the National Academy of Sciences* 105(30):10308-10313.

- Gongora, Jaime, Nicolas J. Rawlence, Victor A. Mobegi, Han Jianlin, Jose A. Alcalde, Jose T. Matus, Olivier Hanotte, Chris Moran, Jeremy J. Austin, Sean Ulm, Atholl J. Anderson, Greger Larson, and Alan Cooper. 2008b. Reply to Storey et al.: More DNA and Dating Studies Needed for Ancient El Arenal-1 Chickens. *Proceedings of the National Academy of Sciences* 105(48):E100.
- Grant, Campbell. 1978. Eastern Coastal Chumash. In *Handbook of North American Indians*, edited by William C. Sturtevant. Vol. 8: California, edited by Robert F. Heizer, 509-519. Washington: Smithsonian Institution.
- Green, Roger C. 1966. Linguistic Subgrouping within Polynesia: The Implications for Prehistoric Settlement. *Journal of the Polynesian Society* 75(1):6-38.
- Green, Roger C. 1985. *Subgrouping of the Rapanui Language of Easter Island in Polynesian and its Implications for East Polynesian Prehistory*. Working Paper no. 68, Department of Anthropology, University of Auckland.
- Green, Roger C. 2000. A Range of Disciplines Support a Dual Origin for the Bottle Gourd in the Pacific. *Journal of the Polynesian Society* 109(2):191-197.
- Griffin, James R., and William B. Critchfield. 1972. *The Distribution of Forest Trees in California*. USDA Forest Service research paper PSW-82. Berkeley, CA: US Department of Agriculture.
- Gumilla, Joseph. 1791. *Historia natural, civil y geografica, de las naciones situadas en las riveras del río Orinoco*. Nueva impresión. Barcelona: Carlos Gibert y Tutó.
- Haddon, Alfred C., and James Hornell. 1936. *Canoes of Oceania*. Vol. I: Canoes of Polynesia, Fiji and Micronesia. Reprinted 1975. Bishop Museum Special Publication 27. Honolulu.
- Hale, Horatio. 1846. Ethnography and Philology. In *United States Exploring Expedition during the Years 1838, 1839, 1840, 1841, 1842, under the Command of Charles Wilkes, U.S.N.* Volume 6. Philadelphia: Lea and Blanchard.
- Handy, E. S. Craighill. 1923. *The Native Culture in the Marquesas*. Bishop Museum Bulletin 9. Honolulu.
- Handy, E. S. Craighill. 1932. *Houses, Boats, and Fishing in the Society Islands*. Bishop Museum Bulletin 90. Honolulu.
- Harrington, John P. 1986. *John Peabody Harrington Papers*. Washington: Smithsonian Institution, National Anthropological Archives. Microfilm edition. Millwood, NY: Kraus International Publications.
- Hather, Jon, and Patrick V. Kirch. 1991. Prehistoric Sweet Potato (*Ipomoea batatas*) from Mangaia Island, Central Polynesia. *Antiquity* 65(249):887-893.

The Plank Canoe of Southern California

- Heizer, Robert F. 1938. The Plank Canoe of the Santa Barbara Region, California. *Etnologiska Studier* 7:193-227. Göteborg.
- Heizer, Robert F. 1940. The Frameless Plank Canoe of the California Coast. *Primitive Man* 13(3-4):80-89.
- Heizer, Robert F. 1941a. The Distribution and Name of the Chumash Plank Canoe. *The Masterkey* 15(2):59-61.
- Heizer, Robert F. 1941b. The Plank Canoe (*Dalca*) of Southern Chile. *The Masterkey* 15(3):105-107.
- Heizer, Robert F. 1952. California Indian Linguistic Records: The Mission Indian Vocabularies of Alphonse Pinart. *University of California Anthropological Records* 15(1):1-84. Berkeley: University of California Press.
- Heizer, Robert F. 1955. California Indian Linguistic Records: The Mission Indian Vocabularies of H[enry] W. Henshaw. *University of California Anthropological Records* 15(2):85-202. Berkeley: University of California Press.
- Heizer, Robert F., and William C. Massey. 1953. *Aboriginal Navigation off the Coasts of Upper and Baja California*. Anthropological Papers, no. 39. Smithsonian Institution, Bureau of American Ethnology Bulletin 151. Washington: Government Printing Office.
- Heizer, Robert F., and Mary A. Whipple, eds. 1951. *The California Indians: A Source Book*. Berkeley: University of California Press.
- Henry, Teuira. 1928. *Ancient Tahiti*. Bishop Museum Bulletin 48. Honolulu.
- Heusser, Linda. 1978. Pollen in Santa Barbara Basin, California: A 12,000-yr Record. *Geological Society of America Bulletin* 89:673-678.
- Heusser, Linda. 1995. Pollen Stratigraphy and Paleoecologic Interpretation of the 160-k.y. Record from Santa Barbara Basin, Hole 893A. In *Proceedings of the Ocean Drilling Program, Scientific Results*, edited by J.P. Kennett, J.G. Baldauf, and M. Lyle, vol. 146 (Pt. 2):265-279.
- Higham, Thomas F. G., and W. J. Gumbley. 2001. Early Preserved Polynesian *kumara* Cultivations in New Zealand. *Antiquity* 75(289):511-512.
- Hill, Jane H., and Roscinda Nolasquez, eds. 1973. *Mulu'wetam: The First People*. Banning, CA: Malki Museum Press.
- Hill, Jane H. 2005. *A Grammar of Cupeño*. University of California Publications in Linguistics 136. Berkeley: University of California Press.

- Hill, Jane H. 2007. "External Evidence" in *Historical Linguistic Argumentation: Subgrouping in Uto-Aztecan*. Unpublished manuscript. Presented at the Workshop on Alternative Approaches to Language Classification, LSA 2007 Linguistic Institute, Stanford University. <http://aalc07.psu.edu/papers/HillPaloAlto0707UAsubgroups.pdf>
- Hill, Kenneth C. 1967. *A Grammar of the Serrano Language*. Ph.D. dissertation (linguistics), University of California, Los Angeles.
- Hinton, Leanne. 1991. Takic and Yuman: A Study in Phonological Convergence. *International Journal of American Linguistics* 57(2):133-157.
- Hiroa, Te Rangi (Peter Buck). 1927. *The Material Culture of the Cook Islands (Aitutaki)*. Memoirs of the Board of Maori Ethnological Research, v. 1. New Plymouth, N.Z: Thomas Avery.
- Hock, Hans Henrich. 1986. *Principles of Historical Linguistics*. Berlin: Mouton de Gruyter.
- Hogg, Alan G., Thomas F. G. Higham, David J. Lowe, Jonathan G. Palmer, Paula J. Reimer, and Rewi M. Newnham. 2003. A Wiggle-Match Date for Polynesian Settlement of New Zealand. *Antiquity* 77(295):116-125.
- Holmes, Tommy. 1993. *The Hawaiian Canoe*. Honolulu: Editions Limited.
- Hopi Dictionary Project. 1998. *Hopi Dictionary/Hopìkwa Lavàytutuveni. A Hopi-English Dictionary of the Third Mesa Dialect, with an English-Hopi Finder List and a Sketch of Hopi Grammar*, edited by Kenneth C. Hill, Emory Sekaquaptewa, Mary E. Black, Ekkehart Malotki, and Michael Lomatuway'ma. Tucson: University of Arizona Press.
- Horne, Stephen Philip. 1981. *The Inland Chumash: Ethnography, Ethnohistory and Archeology*. Ph.D. dissertation (anthropology), University of California, Santa Barbara.
- Horridge, G. Adrian. 1986. *Sailing Craft of Indonesia*. Oxford University Press.
- Hovdhaugen, Even. 1986. The Chronology of Three Samoan Sound Changes. In *FOCAL II: Papers from the Fourth International Conference on Austronesian Linguistics*, edited by Paul Geraghty, Lois Carrington, and Stephen A. Wurm, 313-331. Pacific Linguistics C-94. Canberra: Australian National University.
- Howard, Irwin. 1981. Proto-Ellicean. In *Studies in Pacific Languages in Honour of Bruce Biggs*, edited by Jim Hollyman and Andrew Pawley, 101-118. Auckland: Linguistic Society of New Zealand.
- Howay, Frederic W. 1941. *Voyages of the "Columbia" to the Northwest Coast, 1787-1790 and 1790-1793*. Boston: Massachusetts Historical Society.

The Plank Canoe of Southern California

- Hudson, Travis. 1981a. Recently Discovered Accounts Concerning The "Lone Woman" of San Nicolas Island. *Journal of California and Great Basin Anthropology* 3(2):187-199.
- Hudson, Travis. 1981b. To Sea or Not to Sea: Further Notes on the "Oceangoing" Dugouts of North Coastal California. *Journal of California and Great Basin Anthropology* 3(2):269-282.
- Hudson, Travis, and Thomas C. Blackburn. 1982. *The Material Culture of the Chumash Interaction Sphere: 1. Food Procurement and Transportation*. Ballena Press Anthropological Paper 25. Los Altos, CA: Ballena Press, and Santa Barbara, CA: Santa Barbara Museum of Natural History.
- Hudson, Travis, and Thomas C. Blackburn. 1987. *The Material Culture of the Chumash Interaction Sphere: 5. Manufacturing Processes, Metrology and Trade*. Ballena Press Anthropological Paper 31. Los Altos, CA: Ballena Press, and Santa Barbara, CA: Santa Barbara Museum of Natural History.
- Hudson, Travis, Janice Timbrook, and Melissa Rempe. 1978. *Tomol: Chumash Watercraft as Described in the Ethnographic Works of John P. Harrington*. Los Altos, CA: Ballena Press, and Santa Barbara, CA: Santa Barbara Museum of Natural History.
- Hunt, Terry L., and Carl P. Lipo. 2006. Late Colonization of Easter Island. *Science* 311(5767):1603-1606.
- Hunt, Terry L., and Carl P. Lipo. 2008. Evidence for a Shorter Chronology on Rapa Nui (Easter Island). *Journal of Island and Coastal Archaeology* 3(1):140-148.
- Hyde, Villiana Calac, and Eric Elliott. 1994. *Yumáyk Yumáyk, Long Ago*. University of California Publications in Linguistics 125. Berkeley: University of California Press.
- Immel, Diana Lee. 2007. *Two Research Approaches to Ecocultural Restoration in California: Experimental Reintroduction of Showy Indian Clover and Reconstructing an Ethnobotany of the Salinan Tribe*. Ph.D. dissertation (ecology), University of California, Davis.
- Insoll, Timothy. 1993. A Note on a Sewn Canoe in Use at Gao, the Republic of Mali. *The International Journal of Nautical Archaeology* 22(4):345-350.
- Jacobs, Roderick A. 1975. *Syntactic Change: A Cupan (Uto-Aztecan) Case Study*. University of California Publications in Linguistics 79. Berkeley: University of California.
- Jochelson, Waldemar. 1926. The Yukaghir and the Yukaghirized Tungus. Memoir of the American Museum of Natural History (New York). *The Jesup North Pacific Expedition*, edited by Franz Boas, vol. 9. Leiden: Brill, and New York: G. E. Stechart. Reprinted 1975, AMS Press.

- Jones, Terry L. 2010. Polynesians in the New World: The Chumash Connection and Beyond. In *The Gotland Papers. Selected Papers from the VII International Conference on Easter Island and the Pacific: Migration, Identity, and Cultural Heritage*, edited by Paul Wallin and Helene Martinsson-Wallin, 307-318. Visby: Gotland University Press.
- Jones, Terry L., and Kathryn A. Klar. 2005. Diffusionism Reconsidered: Linguistic and Archaeological Evidence for Prehistoric Polynesian Contact with Southern California. *American Antiquity* 70(3):457-484.
- Jones, Terry L., and Kathryn A. Klar. 2006. On Open Minds and Missed Marks: A Response to Atholl Anderson. *American Antiquity* 71(4):765-770.
- Jones, Terry L., and Kathryn A. Klar. 2009. On Linguistics and Cascading Inventions: A Comment on Arnold's Dismissal of a Polynesian Contact Event in Southern California. *American Antiquity* 74(1):173-182.
- Jones, Terry L., and Kathryn A. Klar. 2012. A Land Visited: Reviewing the Case for Polynesian Contact in Southern California. In *Contemporary Issues in California Archaeology*, edited by Terry L. Jones and Jennifer E. Perry, 217-235. Walnut Creek, CA: Left Coast Press.
- Jones, Terry L., Alice A. Storey, Elizabeth A. Matisoo-Smith, and José Miguel Ramírez-Aliaga, eds. 2011. *Polynesians in America: Pre-Columbian Contacts with the New World*. Lanham, MD: Altamira Press.
- Joslin, Terry L. 2010. *Middle and Late Holocene Hunter-Gatherer Adaptations to Coastal Ecosystems Along the Southern San Simeon Reef, California*. Ph.D. dissertation (anthropology), University of California, Santa Barbara.
- Kamakau, Samuel M. 1865. No ke Kaapuni Makaikai i na wahi Kaulana a me na Kupua, a me na'Lii Kahiko mai Hawaii a Niihau. Helu 1. *Ka Nupepa Kuokoa* 4(24):1, Jun. 15, 1865. Honolulu.
- Kamakau, Samuel M. 1867a. Ka Moolelo o Kamehameha I. Helu 11. *Ka Nupepa Kuokoa* 6(3):1, Jan. 19, 1867. Honolulu.
- Kamakau, Samuel M. 1867b. Ka Moolelo o na Kamehameha. Helu 52. *Ka Nupepa Kuokoa* 6(51):1, Dec. 21, 1867. Honolulu.
- Kamakau, Samuel M. 1869. Ka Moolelo Hawaii. Helu 9. *Ke Au Okoa* 5(34):1, Dec. 9, 1869. Honolulu.
- Kamakau, Samuel M. 1870. Ka Moolelo Hawaii. Helu 55. *Ke Au Okoa* 6(37):1, Dec. 29, 1870. Honolulu.

The Plank Canoe of Southern California

- Kamakau, Samuel M. 1976. *The Works of the People of Old. Nā hana a ka po'e kahiko*. Translated from the newspaper Ke Au 'Oko'a by Mary Kawena Pukui. Arranged and edited by Dorothy B. Barrère. Honolulu: Bishop Museum.
- Kamakau, Samuel M. 1991. *Tales and Traditions of the People of Old. Nā mo'olelo o ka po'e kahiko*. Translated from the newspapers Ka Nupepa Kuokoa and Ke Au Okoa by Mary Kawena Pukui. Edited by Dorothy B. Barrère. Honolulu: Bishop Museum.
- Kamakau, Samuel M. 1992. *Ruling Chiefs of Hawaii*. Honolulu: Kamehameha Schools Press.
- Kennett, Douglas J., Brendan J. Culleton, James P. Kennett, Jon M. Erlandson, and Kevin G. Cannariato. 2007. Middle Holocene Climate Change and Human Population Dispersal in Western North America. In *Climate Change and Cultural Dynamics: A Global Perspective on Mid-Holocene Transitions*, edited by David G. Anderson, Kirk A. Maasch, and Daniel H. Sandweiss, 531-557. Amsterdam: Elsevier.
- King, Chester D. 1981. *The Evolution of Chumash Society: A Comparative Study of Artifacts Used in Social System Maintenance in the Santa Barbara Channel Region Before A.D. 1804*. Ph.D. dissertation (anthropology), University of California, Davis.
- Kirch, Patrick V. 1985. *Feathered Gods and Fishhooks: An Introduction to Hawaiian Archaeology and Prehistory*. Honolulu: University of Hawaii.
- Kirch, Patrick V. 1986. Rethinking East Polynesian Prehistory. *Journal of the Polynesian Society* 95(1):9-40.
- Kirch, Patrick V., and Joanna Ellison. 1994. Palaeoenvironmental Evidence for Human Colonization of Remote Oceanic Islands. *Antiquity* 68(259):310-321.
- Kirch, Patrick V., and Roger C. Green. 1987. History, Phylogeny and Evolution in Polynesia. *Current Anthropology* 28(4):161-186.
- Kirch, Patrick V. and Jennifer G. Kahn. 2007. Advances in Polynesian Prehistory: A Review and Assessment of the Past Decade (1993-2004). *Journal of Archaeological Research* 15:191-238.
- Kirch, Patrick V., and Mark D. McCoy. 2007. Reconfiguring the Hawaiian Cultural Sequence: Results of Re-dating the Halawa Dune Site (MO-A1-3), Moloka'i Island. *Journal of the Polynesian Society* 116(4):385-406.
- Klar, Kathryn A. 1977. *Topics in Historical Chumash Grammar*. Ph.D. dissertation (linguistics), University of California, Berkeley.

- Klar, Kathryn A. 2010. Linguistic Evidence for Prehistoric Polynesian-American Contact. In *The Gotland Papers. Selected Papers from the VII International Conference on Easter Island and the Pacific: Migration, Identity, and Cultural Heritage*, edited by Paul Wallin and Helene Martinsson-Wallin, 319-324. Gotland University Press.
- Klar, Kathryn A. 2011. Words from Furthest Polynesia: North and South American Linguistic Evidence for Prehistoric Contact. In Jones et al. (2011), 194-207.
- Klar, Kathryn A., and Terry L. Jones. 2005. Linguistic Evidence for a Prehistoric Polynesia-Southern California Contact Event. *Anthropological Linguistics* 47(4):369-400.
- Klar, Kathryn A., and Terry L. Jones. 2008. On Myths, Mythmakers and Postmodern Science: A Comment on Jeanne Arnold's Dismissal of a Prehistoric Polynesian Contact Event in Southern California. *Rapa Nui Journal* 22(2):88-96. Los Osos, CA: Easter Island Foundation.
- Krämer, Augustin. 1902. *Die Samoa-Inseln. Entwurf einer Monographie mit besonderer Berücksichtigung Deutsch-Samoas*. Stuttgart: E. Schweizerbart.
- Krämer, Augustin. 1994. *The Samoa Islands: An Outline of a Monograph with Particular Consideration of German Samoa*. English translation of Krämer (1902). Honolulu: University of Hawaii.
- Kroeber, Alfred L. 1907. Shoshonean Dialects of California. *University of California Publications in American Archaeology and Ethnology* 4(3):65-165. Berkeley: University of California Press.
- Kroeber, Alfred L. 1909. Notes on Shoshonean Dialects of Southern California. *University of California Publications in American Archaeology and Ethnology* 8(5):235-269. Berkeley: University of California Press.
- Kroeber, Alfred L. 1910. The Chumash and Costanoan Languages. *University of California Publications in American Archaeology and Ethnology* 9(2):237-271. Berkeley: University of California Press.
- Kroeber, Alfred L. 1922. Elements of Culture in Native California. *University of California Publications in American Archaeology and Ethnology* 13(8):259-328. Berkeley: University of California Press. Reprinted with additional diagrams in Heizer and Whipple (1951):3-67.
- Kroeber, Alfred L. 1925. *Handbook of the Indians of California*. Smithsonian Institution, Bureau of American Ethnology Bulletin 78. Washington: Government Printing Office.
- Kroeber, Alfred L. 1939. Cultural and Natural Areas of Native North America. *University of California Publications in American Archaeology and Ethnology* 38:1-242. Berkeley: University of California Press.

The Plank Canoe of Southern California

- Kroeber, Alfred L. 1959. Northern Yokuts. *Anthropological Linguistics* 1(8):1-19.
- Krupa, Viktor. 1982. *The Polynesian Languages: A Guide*. London: Routledge and Kegan Paul.
- Langacker, Ronald W. 1970. The Vowels of Proto Uto-Aztecan. *International Journal of American Linguistics* 36(3):169-180.
- Latcham, Ricardo E. 1930. La dalca de Chiloé y los canales patagónicos. *Boletín del Museo Nacional de Historia Natural* 13:63-72. Santiago.
- Lawler, Andrew. 2010. Beyond *Kon-Tiki*: Did Polynesians Sail to South America? *Science* 328(5984):1344-1347 (11 June 2010). Washington, DC: AAAS.
- Lee, Georgia. 1981. *The Portable Cosmos: Effigies, Ornaments, and Incised Stone from the Chumash Area*. Ballena Press Anthropological Papers 21. Socorro, NM: Ballena Press.
- Lemaître, Yves. 1973. *Lexique du tahitien contemporain*. Paris: Office de la Recherche Scientifique et Technique Outre-Mer.
- Lincoln, Leslie. 1991. *Coast Salish Canoes*. Seattle: Center for Wooden Boats.
- Litwin, Jerzy. 1985. *Sewn Craft of the 19th Century in the European Part of Russia*. In McGrail and Kentley (1985), 253-267.
- Lobo, Frank P., Susan Lobo, and Kelina N. T. Lobo. 2005. Oral Histories with the Acjachemem of San Juan Capistrano. *Journal of the Southwest* 47(1):29-46.
- Lothrop, Samuel K. 1932. Aboriginal Navigation Off the West Coast of South America. *Journal of the Royal Anthropological Institute of Great Britain and Ireland* 62(2):229-256.
- Malécot, André. 1963. Luiseño, a Structural Analysis II: Morpho-Syntax. *International Journal of American Linguistics* 29(3):196-210.
- Malo, David. 1903. *Hawaiian Antiquities (Moolelo Hawaii)*. Translated by Nathaniel B. Emerson. Honolulu: Hawaiian Gazette Co.
- Malo, Davida. 1987. *Ka Mo'olelo Hawaii (Hawaiian Antiquities)*. Edited by Malcolm Naea Chun. Honolulu: The Folk Press, Kapiolani Community College.
- Manaster Ramer, Alexis. 1993. Blood, Tears, and Murder: The Evidence for Proto-Uto-Aztecan Syllable-Final Consonants. In *Historical Linguistics 1991: Papers from the 10th International Conference on Historical Linguistics*, edited by Jaap van Marle, 199-209. *Current Issues in Linguistic Theory* 107. Amsterdam and Philadelphia: John Benjamins.

- Marck, Jeff. 1996. Eastern Polynesian Subgrouping Today. In *Oceanic Culture History: Essays in Honour of Roger Green*, edited by Janet M. Davidson, Geoffrey Irwin, B. Foss Leach, Andrew Pawley, and Dorothy Brown, 491-511. Wellington: New Zealand Journal of Archaeology.
- Marck, Jeff. 2000. *Topics in Polynesian Language and Culture History*. Pacific Linguistics 504. Canberra: Australian National University.
- Martinsson-Wallin, Helene, and Susan J. Crockford. 2001. Early Settlement of Rapa Nui (Easter Island). *Asian Perspectives* 40(2):244-278.
- Matisoo-Smith, Elizabeth. 2009. The Commensal Model for Human Settlement of the Pacific 10 Years On — What Can We Say and Where to Now? *Journal of Island and Coastal Archaeology* 4:151-163.
- Matisoo-Smith, Elizabeth. 2011. Human Biological Evidence for Polynesian Contacts with the Americas: Finding Maui on Mocha? In Jones et al. (2011), 208-222.
- Matisoo-Smith, Elizabeth, and José Miguel Ramirez. 2010. Human Skeletal Evidence of Polynesian Presence in South America? Metric Analyses of Six Crania from Mocha Island, Chile. *Journal of Pacific Archaeology* 1(1):76-88.
- Matisoo-Smith, Elizabeth, Kelly Roberts, Nihal Welikala, Gerald Tannock, Pam Chester, David Feek, and John Flenley. 2008. Recovery of DNA and Pollen from New Zealand Lake Sediments. *Quaternary International* 184:139-149.
- Mauriائي, Tauarea, Raumea Koroa, Inangaro Papatua, Lazaro Ngarima Marii, Papamama Aratangi, Tangimetua Aratangi, Tuaiva Uria Mautairi, Mini Dean, Ta Vaine Rere, Vavia Tangatataia, Moekapiti Tangatakino, Marsa Dodson, and Ivan Dodson. 2006. *Reo Mangaia i te Reo Papa'ā: Puka 'Āite'anga Tara. Mangaia Dialect to English Dictionary and English to Mangaia Dialect Vocabulary*. Rarotonga: Ministry of Education, Government of the Cook Islands.
- McCawley, William. 1996. *The First Angelinos: The Gabrielino Indians of Los Angeles*. Banning, CA: Malki Museum Press, and Novato, CA: Ballena Press.
- McCoy, Mark D. 2007. A Revised Late Holocene Culture History for Moloka'i Island, Hawai'i. *Radiocarbon* 49(3):1273-1322.
- McGrail, Sean. 2004. *Boats of the World: From the Stone Age to Medieval Times*. Revised from the 2001 edition. Oxford University Press.
- McGrail, Sean, and Eric Kentley. 1985. *Sewn Plank Boats: Archaeological and Ethnographic Papers Based on Those Presented to a Conference at Greenwich in November, 1984*. BAR International Series, no. 276; Archaeological Series (National Maritime Museum), no. 10. Oxford: British Archaeological Reports.

The Plank Canoe of Southern California

- McKusick, Marshall B. 1960. Aboriginal Canoes in the West Indies. In *Papers in Caribbean Anthropology*, compiled by Sidney W. Mintz. *Yale University Publications in Anthropology* no. 63:3-11.
- Medina, Alberto. 1984. Embarcaciones chilenas precolombinas: la Dalca de Chiloé. *Revista Chilena de Antropología* 4:121-138.
- Menzies, Archibald, and Alice Eastwood. 1924. Archibald Menzies' Journal of the Vancouver Expedition. *California Historical Society Quarterly* 2(4):265-340.
- Merriam, C. Hart. 1903a. [*Tong-vā Vocabularies*]. Manuscript. C. Hart Merriam Papers Y/24a/V130a (microfilm reel 49). Bancroft Library, Berkeley. Also published in McCawley (1996), 237-264.
- Merriam, C. Hart. 1903b. *Field Check List, Tong-vā*. Manuscript. C. Hart Merriam Papers Y/24a/NH129 (microfilm reel 60). Bancroft Library, Berkeley. Also published in McCawley (1996), 265-270.
- Merriam, C. Hart. 1903c. [*Mo-kal'-um-ne Vocabulary, 1903*]. Manuscript. C. Hart Merriam Papers V211/V89 (microfilm reel 43), Bancroft Library, Berkeley.
- Merriam, C. Hart. 1903d. *Field Check List, Ke-tan-a-moo'-kum* [Tejon]. Manuscript. C. Hart Merriam Papers X/23aa/NH119 (microfilm reel 60). Bancroft Library, Berkeley.
- Merriam, C. Hart. 1907a. *Field Check List, Coahuila (Subtribe Kah'-we'-sik). Palm Springs region...*[1907-1934]. Manuscript. C. Hart Merriam Papers X/23gg/NH123 (microfilm reel 60). Bancroft Library, Berkeley.
- Merriam, C. Hart. 1907b. *Field Check List, "Serrano". Mo-he-ah'-ne-um=Mah'-ring-ah-yum...* [1907-1934]. Manuscript. C. Hart Merriam Papers X/23cc-dd/NH120 (microfilm reel 60). Bancroft Library, Berkeley.
- Merriam, C. Hart. 1907c. *Field Check List, Mo-he-ah'-ne-um = mah'-ring-ah-yum' [Crow] or "Serrano" of San Bernardino Region [and] Yo-hah'-vet-tum [Coyote] of San Manuel Reservation at Pa', North of Redland.* [1907-1934]. Manuscript. C. Hart Merriam Papers X/23cc-dd/NH121 (microfilm reel 60). Bancroft Library, Berkeley.
- Merriam, C. Hart. 1907d. *Vocabularies of North American Indians. Mah'-re-am/Mā-ring-am (Serrano of Morongo) and Mo-he-ah'-ne-um (Serrano of San Bernardino).* [1907-1933]. Manuscript. C. Hart Merriam Papers X/23dd/V125 (microfilm reel 48). Bancroft Library, Berkeley.
- Merriam, C. Hart. 1909. *Field Check List, Maringam = Mah'-re-am...* [1909-1933]. Manuscript. C. Hart Merriam Papers X/23dd/NH121 (microfilm reel 60). Bancroft Library, Berkeley.

- Merriam, C. Hart. 1910. *Field Check List, Pow'-we-am, Cahuilla of Santa Rosa in Mtns...* Manuscript. C. Hart Merriam Papers X/23kk/NH124 (microfilm reel 60). Bancroft Library, Berkeley.
- Merriam, C. Hart. 1933. *Field Check List, Koo'-pah of Warner Valley...* [1933-1934]. Manuscript. C. Hart Merriam Papers X/23mm/NH125 (microfilm reel 60). Bancroft Library, Berkeley.
- Merriam, C. Hart. 1979. *Indian Names for Plants and Animals among Californian and Other Western North American Tribes*. Assembled and annotated by Robert F. Heizer. Ballena Press Publications in Archaeology, Ethnology and History, no. 14. Socorro, NM: Ballena Press.
- Milliken, Randall, and John R. Johnson. 2003. *Salinan and Northern Chumash Communities of the Early Mission Period*. Davis, CA: Far Western Anthropological Research Group.
- Mudge, Zachariah Atwell. 1880. *Fur-Clad Adventurers. Or, Travels in Skin-Canoes, on Dog-Sledges, on Reindeer, and on Snow-Shoes, through Alaska, Kamchatka, and Eastern Siberia*. New York: Phillips and Hunt, and Cincinnati: Walden and Stowe.
- Munro, Pamela. 1977. Towards a Reconstruction of Uto-Aztecan Stress. In *Studies in Stress and Accent*, edited by Larry M. Hyman, 303-326. Los Angeles: University of Southern California.
- Munro, Pamela. 1983. Selected Studies in Uto-Aztecan Phonology. *International Journal of American Linguistics* 49(3):277-298.
- Munro, Pamela. 1990. Stress and Vowel Length in Cupan Absolute Nouns. *International Journal of American Linguistics* 56(2):217-250.
- Munro, Pamela. 2000. The Gabrielino Enclitic System. In *Uto-Aztecan: Structural, Temporal, and Geographic Perspectives. Papers in Memory of Wick R. Miller by the Friends of Uto-Aztecan*, edited by Eugene H. Casad and Thomas L. Willet, 183-201. Hermosillo, Sonora: Editorial Unison.
- Munro, Pamela. 2002. Takic Foundations of Nicoleño Vocabulary. In *Proceedings of the Fifth California Islands Symposium*, edited by David R. Browne, Kathryn L. Mitchell, and Henry W. Chaney, 659-668. Santa Barbara: Santa Barbara Museum of Natural History.
- Nicolay, Scott. 2005. Review of Jones and Klar (2005). *Rapa Nui Journal* 19(2):141-142. Los Osos, CA: Easter Island Foundation.
- Nicolay, Scott. 2007. Review of Anderson (2006) and Jones and Klar (2006). *Rapa Nui Journal* 21(1):64-66. Los Osos, CA: Easter Island Foundation.

The Plank Canoe of Southern California

- Nordhoff, Charles. Notes on the Off-Shore Fishing of the Society Islands. *Journal of the Polynesian Society* 39(154):137-173.
- Ohtsuka, Kazuyoshi. 1999. *Itaomachip*: Reviving a Boat-Building and Trading Tradition. In *Ainu, Spirit of a Northern People*, edited by William W. Fitzhugh and Chisato O. Dubreuil, 374-376. Washington: Arctic Studies Center, National Museum of Natural History, Smithsonian Institution, in association with University of Washington Press.
- Olson, Ronald L. 1927. Adze, Canoe and House Types of the Northwest Coast. *University of Washington Publications in Anthropology* 2(1):1-38.
- Olson, Ronald L. 1930. Chumash Prehistory. *University of California Publications in American Archaeology and Ethnology* 28(1):1-21. Berkeley: University of California Press.
- Pawley, Andrew. 1966. Polynesian Languages: A Subgrouping Based on Shared Innovations in Morphology. *Journal of the Polynesian Society* 75(1):39-64.
- Pawley, Andrew, and Medina Pawley. 1998. Canoes and Seafaring. In *The Lexicon of Proto Oceanic*, edited by Malcolm Ross, Andrew Pawley, and Meredith Osmond. Vol. 1: Material Culture: The Culture and Environment of Ancestral Oceanic Society, 173-210. Pacific Linguistics C-152. Canberra: Australian National University.
- Petard, Paul. 1972. *Raau Tahiti: The Use of Polynesian Medicinal Plants in Tahitian Medicine*. Technical Paper 167. Nouméa, New Caledonia: South Pacific Commission.
- Pirazzoli, Paolo A., and Lucien F. Montaggioni. 1988. Holocene Sea-Level Changes in French Polynesia. *Palaeogeography, Palaeoclimatology, Palaeoecology* 68:153-175.
- Polach, Henry A. 1976. Radiocarbon Dating as a Research Tool in Archaeology: Hopes and Limitations. In *Proceedings of a Symposium on Scientific Methods of Research in the Study of Ancient Chinese Bronzes and South East Asian Metal and Other Archaeological Artifacts*, edited by Noel Barnard, 255-298. Canberra: Australian National University.
- Pratt, George. 1893. *A Grammar and Dictionary of the Samoan language, with English and Samoan Vocabulary*. 3rd ed. London: London Missionary Society.
- Prins, Adriaan Hendrik Johan. 1986. *A Handbook of Sewn Boats: The Ethnography and Archaeology of Archaic Plank-Built Craft*. Maritime Monographs and Reports no. 59. London: Trustees of the National Maritime Museum.
- Puente Blanco, Manuel. 1986. La "Dalca" de Chiloé. Su influencia en la exploración austral. Contribución a su estudio. *Revista de Historia Naval (Madrid)* 4(15):19-44.
- Pukui, Mary Kawena, and Samuel A. Elbert. 1986. *Hawaiian Dictionary*. Honolulu: University of Hawaii.

- Raab, L. Mark, Jim Cassidy, Andrew Yatsko, and William J. Howard. 2009. *California Maritime Archaeology: A San Clemente Island Perspective*. Lanham, MD: AltaMira Press.
- Ramón, Dorothy, and Eric B. Elliott. 2000. *Wayta' Yawa': Always Believe*. Banning, CA: Malki Museum Press.
- Rau, Charles. 1884. *Prehistoric Fishing in Europe and North America*. Washington: Smithsonian Institution.
- Reichlen, Henry, and Paule Reichlen. 1971. Le manuscrit Boscana de la Bibliothèque Nationale de Paris. Relation sur les Indiens Acâgchemem de la Mission de San Juan Capistrano, Californie. *Journal de la Société des Américanistes* 60:233-273.
- Rensch, Karl H. 1991a. *Tikitionario Mangareva-'Arani. Dictionnaire Mangarevien-Français*. Canberra: Archipelago Press.
- Rensch, Karl H. 1991b. Polynesian Plant Names: Linguistic Analysis and Ethnobotany, Expectations and Limitations. In *Islands, Plants and Polynesians: An Introduction to Polynesian Ethnobotany*, edited by Paul Alan Cox and Sandra Anne Banack, 97-111. Portland, OR: Dioscorides Press.
- Rick, Torben C. 2004. *Daily Activities, Community Dynamics, and Historical Ecology on California's Northern Channel Islands*. Ph.D. dissertation (anthropology), University of Oregon.
- Rick, Torben C., Jon M. Erlandson, René L. Vellanoweth, Todd J. Braje. 2005. From Pleistocene Mariners to Complex Hunter-Gatherers: The Archaeology of the California Channel Islands. *Journal of World Prehistory* 19:169-228.
- Rieth, Timothy M., Terry L. Hunt, Carl Lipo, and Janet M. Wilmshurst. 2011. The 13th Century Polynesian Colonization of Hawai'i Island. *Journal of Archaeological Science* 38:2740-2749.
- Robinson, Alfred. 1846. *Life in California during a Residence of Several Years in That Territory*. New York: Wiley and Putnam.
- Robinson, Eugene. 1942. Plank Canoes of the Chumash. *The Masterkey* 16(6):202-209.
- Robinson, Eugene. 1943. Plank Canoes of the Chumash — Concluded. *The Masterkey* 17(1):13-19.
- Roth, Walter Edmund. 1924. *An Introductory Study of the Arts, Crafts and Customs of the Guiana Indians*. Thirty-Eighth Annual Report of the Bureau of American Ethnology to the Secretary of the Smithsonian Institution, 1916-1917. Washington: Government Printing Office.

The Plank Canoe of Southern California

- Roussel, Hippolyte. 1908. Vocabulaire de la langue de l'Île-de-Pâques ou Rapanui. *Le Muséon* 27:159-254. Paris.
- Rousselot, Jean-Loup. 1994. Watercraft in the North Pacific: A Comparative View. In *Anthropology of the North Pacific Rim*, edited by William W. Fitzhugh and Valérie Chaussonnet, 243-258. Washington: Smithsonian Institution.
- Sapir, Edward. 1931. Southern Paiute Dictionary. *Proceedings of the American Academy of Arts and Sciences* 65(3):537-730.
- Savage, Stephen. 1962. *A Dictionary of the Maori Language of Rarotonga*. Wellington: Department of Island Territories.
- Scaglione, Richard. 2005. *Kumara* in the Ecuadorian Gulf of Guayaquil? In *The Sweet Potato in Oceania: A Reappraisal*, edited by Chris Ballard, Paula Brown, R. Michael Bourke, and Tracy Harwood, 35-41. Sydney: University of Sydney Press.
- Scaglione, Richard, and María-Auxiliadora Cordero. 2011. Did Ancient Polynesians Reach the New World? Evaluating Evidence from the Ecuadorian Gulf of Guayaquil. In Jones et al. (2011), 171-193.
- Seiler, Hansjakob, and Kojiri Hioki. 1979. *Cahuilla Dictionary*. Banning, CA: Malki Museum Press.
- Shibata, Norio. 2003. *Penrhyn-English Dictionary*. Endangered Languages of the Pacific Rim, Publication A1-005. Tokyo: Institute for the Study of Languages and Cultures in Asia and Africa (ILCAA).
- Sinoto, Yosihiko H. 1979. The Marquesas. In *The Prehistory of Polynesia*, edited by Jesse D. Jennings, 110-134. Canberra: Australian National University.
- Smith, Robert. 1970. The Canoe in West African History. *Journal of African History* 11(4):515-533.
- Smith, Julian. 2011. Polynesian Contact? *American Archaeology* 15(3):38-43.
- Sparkman, Philip S. 1908. The Culture of the Luiseño Indians. *University of California Publications in American Archaeology and Ethnology* 8(4):187-234. Berkeley: University of California Press.
- Spriggs, Matthew. 1989. The Dating of the Island Southeast Asian Neolithic: An Attempt at Chronometric Hygiene and Linguistic Correlation. *Antiquity* 63(240):587-613.

- Spriggs, Matthew. 2010. 'I Was So Much Older Then, I'm Younger Than That Now': Why the Dates Keep Changing for the Spread of Austronesian Languages. In *A Journey through Austronesian and Papuan Linguistic and Cultural Space: Papers in Honour of Andrew K. Pawley*, edited by John Bowden, Nikolaus P. Himmelmann and Malcolm Ross, 113-140. Pacific Linguistics 615. Canberra: Australian National University.
- Spriggs, Matthew, and Atholl Anderson. 1993. Late Colonization of East Polynesia. *Antiquity* 67(255):200-217.
- Stewart, Hilary. 1984. *Cedar: Tree of Life to the Northwest Coast Indians*. Vancouver: Douglas and McIntyre, and Seattle: University of Washington Press.
- Stimson, J. Frank. 1964. *A Dictionary of Some Tuamotuan Dialects of the Polynesian Language*. The Hague: Martinus Nijhoff.
- Storey, Alice A., Daniel Quiróz, and Elizabeth A. Matisoo-Smith. 2011. A Reappraisal of the Evidence for Pre-Columbian Introduction of Chickens to the Americas. In Jones et al. (2011), 139-170.
- Storey, Alice A., Daniel Quiroz, José Miguel Ramírez, Nancy Beavan-Athfield, David J. Addison, Richard Walter, Terry Hunt, J. Stephen Athens, Leon Huynen, and Elizabeth A. Matisoo-Smith. 2008. Pre-Columbian Chickens, Dates, Isotopes, and mtDNA. *Proceedings of the National Academy of Sciences* 105(48):E99.
- Storey, Alice A., José Miguel Ramírez, Daniel Quiroz, David V. Burley, David J. Addison, Richard Walter, Atholl J. Anderson, Terry L. Hunt, J. Stephen Athens, Leon Huynen, and Elizabeth A. Matisoo-Smith. 2007. Radiocarbon and DNA Evidence for a Pre-Columbian Introduction of Polynesian Chickens to Chile. *Proceedings of the National Academy of Sciences* 104(25):10335-10339.
- Strong, William Duncan. 1929. Aboriginal Society in Southern California. *University of California Publications in American Archaeology and Ethnology* 26. Berkeley: University of California Press.
- Stuiver, Minze, Paula J. Reimer, and R. W. Reimer. 2006. CALIB 5.1 (software package), with IntCal04 and Marine04 4.14c calibration curves. <http://calib.qub.ac.uk> . Accessed Dec. 20, 2009.
- Sutton, Douglas G., John R. Flenley, Xun Li, Arthur Todd, Kevin Butler, Rachel Summers, and Pamela I. Chester. 2008. The Timing of the Human Discovery and Colonization of New Zealand. *Quaternary International* 184:109-121.
- Sutton, Mark Q. 2009. People and Language: Defining the Takic Expansion into Southern California. *Pacific Coast Archaeological Society Quarterly* 41(2-3):31-93.

The Plank Canoe of Southern California

- Sutton, Mark Q. 2010a. A Reevaluation of Early Northern Uto-Aztecan Prehistory in Alta California. *California Archaeology* 2(1):3-30.
- Sutton, Mark Q. 2010b. The Del Rey Tradition and Its Place in the Prehistory of Southern California. *Pacific Coast Archaeological Society Quarterly* 44(2):1-54.
- Taylor, Alexander S. 1860a. Santa Ynez and the Santa Barbara County Indians. California Notes: The Indianology of California, no. 7. *The California Farmer and Journal of Useful Sciences*, 13(11):82, May 4th, 1860. Sacramento.
- Taylor, Alexander S. 1860b. The Island of Santa Cruz Indians, near Santa Barbara. California Notes: The Indianology of California, no. 8. *The California Farmer and Journal of Useful Sciences*, 13(11):82, May 4th, 1860. Sacramento.
- Taylor, Alexander S. 1860c. Indians of the Mission of San Gabriel, etc. California Notes: The Indianology of California, no. 9. *The California Farmer and Journal of Useful Sciences*, 13(12):90, May 11th, 1860. Sacramento. Reprinted in McCawley (1996:271-274).
- Timbrook, Jan. 2007. *Chumash Ethnobotany: Plant Knowledge Among the Chumash People of Southern California*. Santa Barbara, CA: Santa Barbara Museum of Natural History, and Berkeley, CA: Heyday Books.
- Tregear, Edward. 1891. *The Maori-Polynesian Comparative Dictionary*. Wellington: Lyon and Blair.
- Tregear, Edward. 1899. *A Dictionary of Mangareva (or Gambier Islands)*. Wellington: John MacKay, Government Printing Office.
- Vairo, Carlos Pedro. 2002. *The Yamana Canoe. The Marine Tradition of the Aborigines of Tierra del Fuego*. Ushuaia (Argentina): Zagier y Urruty. Translation of Vairo, Carlos Pedro. 1995. *Los Yamana*. Ushuaia: Zagier y Urruty.
- Vancouver, George. 1984. *A Voyage of Discovery to the North Pacific Ocean and Round the World, 1791-1795. With an Introduction and Appendices*. Edited by W. Kaye Lamb. London: Hakluyt Society.
- Vizcaíno, Juan. 1959. *The Sea Diary of Fr. Juan Vizcaíno to Alta California, 1769*. Translated with an introduction by Arthur Woodward. Los Angeles: G. Dawson.
- Voegelin, Charles F. 1958. Working Dictionary of Tübatulabal. *International Journal of American Linguistics* 24(3):221-228.
- Wagner, Henry R. 1928. Spanish Voyages to the Northwest Coast in the Sixteenth Century. Chapter IV: The Voyage of Juan Rodriguez Cabrillo. *California Historical Society Quarterly* 7(1):20-77.

- Wahlroos, Sven. 2002. *English-Tahitian, Tahitian-English Dictionary = Fa'atoro parau marite/peretane-Tahiti, Tahiti-marite/peretane*. Honolulu: Mā'ohi Heritage Press.
- Walker, Philip L., and Michael J. DeNiro. 1986. Stable Nitrogen and Carbon Isotope Ratios in Bone Collagen as Indices of Prehistoric Dietary Dependence on Marine and Terrestrial Resources in Southern California. *American Journal of Physical Anthropology* 71:51-61.
- Wallace, William J. 1978a. Southern Valley Yokuts. In *Handbook of North American Indians*, edited by William C. Sturtevant. Vol. 8: California, edited by Robert F. Heizer, 448-461. Washington: Smithsonian Institution.
- Wallace, William J. 1978b. Music and Musical Instruments. In *Handbook of North American Indians*, edited by William C. Sturtevant. Vol. 8: California, edited by Robert F. Heizer, 642-648. Washington: Smithsonian Institution.
- Walworth, Mary. 2012. *Eastern Polynesian: The Linguistic Evidence Revisited*. Talk given at the Twelfth International Conference on Austronesian Linguistics (12ICAL), July 2012. Bali.
- Wash, Suzanne. 2001. *Adverbial Clauses in Barbareño Chumash Narrative Discourse*. Ph.D. dissertation (linguistics), University of California, Santa Barbara.
- Weisler, Marshall I. 1993. *Long-Distance Interaction in Prehistoric Polynesia: Three Case Studies*. Ph.D. dissertation (anthropology), University of California, Berkeley.
- Weisler, Marshall I. 1994. The Settlement of Marginal Polynesia: New Evidence from Henderson Island. *Journal of Field Archaeology* 21(1):83-102.
- Weisler, Marshall I., and Roger C. Green. 2008. The Many Sides of Polynesian Archaeology in Reference to the Colonization Process in Southeast Polynesia. *Rapa Nui Journal* 22(2):85-87. Los Osos, CA: Easter Island Foundation.
- Weisler, Marshall I., and Roger C. Green. 2011. Rethinking the Chronology of Colonization of Southeast Polynesia. In Jones et al. (2011), 223-246.
- Whistler, Kenneth W. 1980. *An Interim Barbareño Chumash Dictionary (of Barbareño as Spoken by Mary Yee)*. Self-published.
- Williams, Herbert W. 1971. *A Dictionary of the Maori Language*. 7th edition (reprinted 1975). Wellington, New Zealand: A. R. Shearer, Government Printer.
- Wilmshurst, Janet M., Atholl J. Anderson, Thomas F. G. Higham, and Trevor H. Worthy. 2008. Dating the Late Prehistoric Dispersal of Polynesians to New Zealand Using the Commensal Pacific Rat. *Proceedings of the National Academy of Sciences* 105(22):7676-7680.

The Plank Canoe of Southern California

- Wilmshurst, Janet M., and Thomas F. G. Higham. 2004. Using Rat-Gnawed Seeds to Independently Date the Arrival of Pacific Rats and Humans in New Zealand. *The Holocene* 14(6):801-806.
- Wilmshurst, Janet M., Terry L. Hunt, Carl P. Lipo, and Atholl J. Anderson. 2011. High-Precision Radiocarbon Dating Shows Recent and Rapid Initial Human Colonization of East Polynesia. *Proceedings of the National Academy of Sciences* 108(5):1815-1820.
- Wilson, William H. 1985. Evidence for an Outlier Source for the Proto Eastern Polynesian Pronominal System. *Oceanic Linguistics* 24(1-2):85-133.
- Woodward, Arthur. 1934. An Early Account of the Chumash. *The Masterkey* 8(4):118-123.
- Woodward, Lisa L. 2007. *The Acjachemen of San Juan Capistrano: The History, Politics and Language of an Indigenous California Community*. Ph.D. dissertation (Native American Studies), University of California, Davis.
- Yen, Douglas E. 1974. *The Sweet Potato and Oceania: An Essay in Ethnobotany*. Bishop Museum Bulletin 236. Honolulu.
- Zewen, François. 1987. *Introduction à la langue des îles Marquises. Le parler de Nukuhiva*. Pape'ete: Haere Pō no Tahiti.
- Zigmond, Maurice L. 1981. *Kawaiisu Ethnobotany*. Salt Lake City: University of Utah.
- Zigmond, Maurice L., Curtis G. Booth, and Pamela Munro. 1991. *Kawaiisu: A Grammar and Dictionary with Texts*. University of California Publications in Linguistics 119. Berkeley: University of California Press.

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REPORT 15

**SURVEY OF CALIFORNIA AND
OTHER INDIAN LANGUAGES**

*Structure and Contact in
Languages of the Americas*

John Sylak-Glassman and Justin Spence, Editors

Andrew Garrett and Leanne Hinton, Series Editors

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